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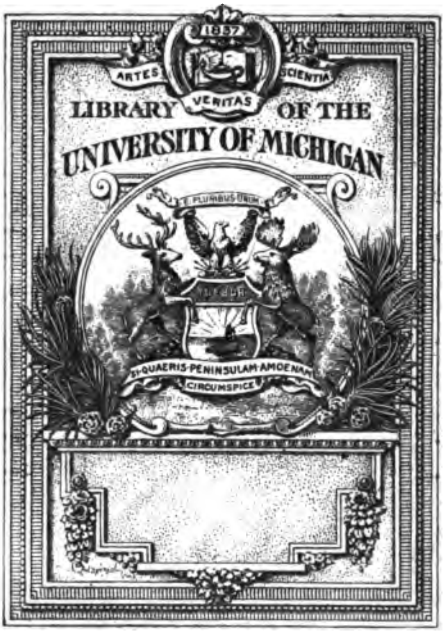

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EIGHTH BIENNIAL REPORT

OF THE

California

STATE BOARD OF HORTICULTURE

OF THE

STATE OF CALIFORNIA,

FOR 1901-1902.

SACRAMENTO:
A. J. JOHNSTON, : : : : : : : SUPERINTENDENT STATE PRINTING.
1902.

CALIFORNIA STATE BOARD OF HORTICULTURE.

ELLWOOD COOPER............President............Santa Barbara,
Commissioner for the Los Angeles District.

FRANK H. BUCK............Vice-President............Vacaville,
Commissioner for the Napa District.

RUSS D. STEPHENS............Auditor and Treasurer............Sacramento,
Commissioner for the State at Large.

A. B. HUMPHREY............Treasurer............Sacramento,
Commissioner for the Sacramento District.

M. J. DANIELS............Riverside,
Commissioner for the State at Large.

THOMAS A. HENDER............Sonora,
Commissioner for the El Dorado District.

A. C. EISEN............Fresno,
Commissioner for the San Joaquin District.

A. B. CASH............Santa Clara,
Commissioner for the San Francisco District.

W. J. HOTCHKISS............Healdsburg,
Commissioner for the Sonoma District.

J. J. KEEGAN............Secretary,
Office: State Capitol, Sacramento.

ALEXANDER CRAW............Quarantine Officer and Entomologist,
Office: Clay Street Dock, San Francisco.

GERTRUDE BIRD............Clerk.

OFFICES:

State Capitol, Sacramento.

Branch Office, Clay Street Dock, San Francisco.

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REPORT.

OFFICE OF STATE BOARD OF HORTICULTURE,
STATE CAPITOL, SACRAMENTO, CAL., December 31, 1902.

To His Excellency HENRY T. GAGE, *Governor, and the Honorable the Senate and Assembly of California:*

We have the honor to submit herewith this, our biennial report, showing the operations of the State Board of Horticulture for the years 1901 and 1902.

Respectfully submitted.

ELLWOOD COOPER,
FRANK H. BUCK,
THOS. A. HENDER,
M. J. DANIELS,
A. B. HUMPHREY,
A. C. EISEN,
A. B. CASH,
W. J. HOTCHKISS,
R. D. STEPHENS,
Commissioners.

Attest:
J. J. KEEGAN, Secretary.

REPORT OF THE SECRETARY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: On May 3, 1901, B. M. Lelong, who had for many years been the able and efficient Secretary and Chief Horticultural Officer of the State Board of Horticulture, died in Sacramento. His aid to the horticulturists of this State had been of the greatest value, as evidenced by the number of bulletins that had been issued under his supervision, on horticulture and the propagation, budding, and grafting of deciduous fruit, nut, and citrus trees. His crowning work, and his last, "Culture of the Citrus in California," was issued shortly before his death, and the demand for it, from all over the world, was so great that the first edition was soon exhausted and the Board was compelled to issue a revised edition of 2,000 copies during the present year, in order to supply the many requests for it, which still continue. By the death of Mr. Lelong the horticulturists of this State lost a most valuable and energetic worker, and many warm friends and acquaintances mourn his early demise.

Alexander Craw, Quarantine Officer and Entomologist of the Board, assumed charge of the office temporarily, and performed the duties with his accustomed ability and dispatch.

A letter was received from Wm. B. Gester, Commissioner from the El Dorado district, and Treasurer of the Board, dated Saucillo, Chihuahua, Mexico, May 11, 1901, and presented to the Board at their meeting of May 20, 1901, suggesting that, in view of his absence from the State, some one else should be elected to the office of Treasurer. H. Weinstock, of the Sacramento district, was unanimously elected Treasurer.

July 20, 1901, John Isaac was appointed Secretary ad interim, pending the regular election of the Secretary, but was detained in the Quarantine Department until August 1, 1901.

A decision having been rendered by Judge Ellison, of Tehama, that County Horticultural Commissioners, and Local Inspectors appointed by County Horticultural Commissioners, have no right to inspect and condemn nursery stock imported into this State, that power being conferred exclusively upon the State Board of Horticulture and the Quarantine Guardians appointed by the State Board, Mr. Isaac issued certificates of quarantine guardianship to all the County Horticultural Commissioners and Local Inspectors in the State, empowering them to act as officers of the Board to protect the fruit interests of the different counties according to law. The counties of this State which have appointed Horticultural Commissioners are thus protected from the danger of importing injurious fungous and insect pests. Thirty-one counties of the State, the principal horticultural ones, have complied with the law. A pamphlet containing the names and addresses of all the County Horticultural Commissioners, Local Inspectors, and Quarantine Guardians was compiled and issued by Mr. Isaac. He also compiled, in a pamphlet of fifty-seven pages, the Horticultural Statutes of California, with court decisions and legal opinions relating thereto, and forwarded copies to the Horticultural Commissioners in the different counties. It will prove a great aid to them and facilitate their action.

I assumed the duties of Secretary and Chief Horticultural Officer of the State Board of Horticulture January 1, 1902, succeeding John Isaac, who had been appointed Secretary pending the election of a successor to B. M. Lelong, deceased.

On January 4, 1902, I forwarded to the Attorney-General the complaint of the Orchardists' Association of the Pajaro Valley against Reddington & Co. and Mack & Co., of San Francisco, for selling Paris green which did not comply with the requirements of the law. A reply was received from the Attorney-General, acknowledging the receipt of the complaint, and promising to give the matter prompt attention.

On March 6, 1902, a letter was received from Professor Woodworth, proposing the coöperation of this Board with the University of California in the publication of a bulletin on the principal pernicious and beneficial insects of this State. The appropriation allowed for printing is only $2,500 per year, all of which is consumed in the publication of the proceedings of the Fruit-Growers' Convention, Biennial Report, and the necessary bulletins issued by this Board from time to time, leaving no surplus for such work.

On March 8, 1902, John Isaac was appointed Special Agent of this Board by the Executive Committee, and instructed to visit and inspect the orchards in the different counties of this State and report on the extent and destructiveness of the pear-blight, olive-knot, and other diseases existing and threatening the horticultural interests of the State, and incidentally to inquire into the probability of introducing the Morelos orange maggot (which is not now found in our State) across the Mexican border into our orange-growing section. From time to time reports were filed in this office by Mr. Isaac, which will be found under their headings in the Biennial Report.

On May 15, 1902, the following letter was received from J. A. Filcher, Secretary and General Manager of the California State Board of Trade:

SAN FRANCISCO, CAL., May 14, 1902.

J. J. KEEGAN, ESQ., *Secretary State Board of Horticulture, Sacramento, California:*

DEAR SIR: At the meeting of the State Board of Trade, held on the 13th of this month, the following resolution, introduced by President Chipman, of the Board, was unanimously adopted, viz:

"WHEREAS, The attention of this Board has been called to the fact that a certain firm in the City of Los Angeles has been selling to consumers, as a ripe pickled olive, an imitation ripe olive which is dangerous to health, if not to life itself; and,

"WHEREAS, It has been declared that these olives were cured green and afterward colored black, by the use of a deleterious coloring matter, to imitate ripe olives; and,

"WHEREAS, It is of the highest importance to the olive industry of this State that such vicious and fraudulent practices be prevented and the perpetrators prosecuted to the limit of the law; therefore,

"*Resolved*, That the State Board of Horticulture be requested to ask the opinion of the Attorney-General of the State as to whether the guilty parties can be prosecuted under any law of the State or United States, and if so, that steps be taken at once to enforce such law;

"*Resolved further*, That the Secretary of this Board enclose with a copy hereof the facts as stated by the Los Angeles Times of April 6, 1902, and in the letter of Hon. Ellwood Cooper, and forward the same to the Secretary of the State Board of Horticulture."

The foregoing resolution is self-explanatory. A copy of the article from the Los Angeles Times referred to and the letter of Hon. Ellwood Cooper are herewith enclosed.

Trusting your organization will take up this matter vigorously and make it so uncomfortable for the offender that like practices will not be indulged in in the future, I remain

Yours very truly,

J. A. FILCHER,
Secretary and General Manager.

The foregoing letter was accompanied by a letter from President Ellwood Cooper of this Board on the proper pickling of olives, and deprecating the coloring of green olives in any manner to resemble ripe olives and severely condemning such practice. Also, by an extract from the Los Angeles Times, giving an account of people who had suffered severely from the effects of the coloring matter which had been used on olives.

Believing that the laws of this State were amply sufficient for the prosecution and conviction of the guilty parties, I communicated with the District Attorney and Health Officer of Los Angeles, to ascertain if any action had been taken toward the prosecution of the parties who had been engaged in such practices. Replies were received, stating that the guilty parties had been promptly prosecuted and heavily fined. Copies of these letters were forwarded to the State Board of Trade, and a reply was received from General Manager J. A. Filcher, stating that these communications served as an answer to the resolution adopted by that Board, and that they would be read at the next meeting of the Board of Trade, much to the interest of the members.

The first edition of "Culture of the Citrus in California" having become exhausted, a revised edition was prepared, and articles on the "Mottled Leaf," "The Die-Back Trouble," "Cultivation and Irrigation," "Orange and Lemon Rot," and other data, to bring the work up to date, were inserted. An edition of two thousand copies was ordered printed. The many requests for copies of this work which had been accumulating for some time have been complied with, and the orders received almost daily are promptly filled.

Complaints of grasshoppers appearing in large and threatening numbers had been made from widely separated and isolated places in the State, and in some sections parties had been burning the grass on pasture lands in order to destroy the pests, against the protests of the owners, who were threatening to oppose force to such means of destruction, and conflicts between the owners of pasture lands and those engaged in their burning-over, in some localities under orders from Supervisors, were occurring. In order to ascertain the exact legal rights and powers of all parties in the matter, on June 16, 1902, President Dillman, of the Board of Supervisors of Sacramento County, requested me to obtain an opinion from the Attorney-General on the powers of the State to protect the orchards of certain counties in the Sacramento Valley from threatened destruction by the so-called grasshopper plague, and the authority and power which may be exercised by the State Board of Horticulture in connection with the above matter. The reasons assigned by Mr. Dillman were that Sacramento County was engaged in fighting the pests by burning-over pasture lands where the grasshoppers were numerous; that the adjoining counties, particularly Placer County, refused to take such action; and that all the labor and sacrifices of Sacramento County would be in vain unless the same action was taken by adjoining counties. Professor Woodworth, Entomologist of the California State University, accompanied Mr. Dillman. In reply to the inquiry, whether he favored the proposed burning-over of pasture lands, Professor Woodworth stated that he deemed it advisable. The matter of the determination of the power to burn the grass on pasture lands without the consent of the owner was deemed most urgent, and I was requested to communicate with the Attorney-General by telephone, and was assured that he would promptly reply in the same manner. I immediately complied with the request, and the following opinion was received:

ATTORNEY-GENERAL'S OFFICE, STATE OF CALIFORNIA,
SAN FRANCISCO, CAL., June 17, 1902.

MR. J. J. KEEGAN, *Secretary State Board of Horticulture, Sacramento, Cal.:*

DEAR SIR: You ask the opinion of this office respecting—

1. The power of the State to protect the orchards of certain counties in the Sacramento Valley from threatened destruction by the so-called grasshopper plague.

2. The authority and power which may be exercised by the State Board of Horticulture in connection with the above matter.

In reply to your first inquiry, I beg to say that the State of California, in its sovereign capacity, is clothed with inherent power to protect and preserve its own existence and to do all things needful to prevent or avert a threatened calamity involving widespread destruction of persons or property. This power is based, in part, upon the old and well-known principle that private right is, and always must be, subservient to the public good. In exercising the power thus inherently belonging to the sovereign, the State of California may, where it becomes necessary, take, use, or destroy the private property of individuals to prevent the impending calamity; as, for instance, to stop the spreading of a fire, to stay the ravages of a pestilence, to arrest the advance of a hostile army, or to prevent any other great public calamity. This power of the State to act in cases of great public necessity does not require statutory authority, but comes directly from the natural law, from the right of self-preservation.

Of course, the facts must warrant the exercise of this unusual and extraordinary power of the State. According to the authorities the necessity therefor must be "extreme, imperative, and overwhelming." Whether the facts to which you refer would warrant the exercise of the power above noted, is a question upon which I can, of course, express no opinion. This question being one of fact must be determined by those who represent the State in the exercise of the above-described power. If the threatened calamity to which you refer is imminent, grave, and far-reaching in its results; if it affects a considerable section of the State, involving several counties therein; if the burning-over of several pasture lands will prevent the threatened calamity; if by no other means the threatened calamity can be averted; then, in my judgment, a condition has arisen which would warrant the State in making use of the inherent and sovereign power above noted.

Referring to the second branch of your inquiry, I beg to state that the State Board of Horticulture, being a creature of the statute, is clothed with no sovereign powers, but is limited to the powers specifically conferred upon it by statute or those necessarily implied from the statutory powers thus specifically granted. I find no statutory authority which would warrant your Board in taking any of the suggested steps to arrest the threatened calamity to which you refer, such as the burning of pasture lands and the like; nor do I find any statute of this State conferring upon any officer, specifically, the powers herein discussed. It follows, therefore, that this power of the State can alone be exercised by its Chief Executive, in whom, under the provisions of our State Constitution, is vested the supreme executive power of the State.

Very truly yours,

TIREY L. FORD,
Attorney-General.

Governor Gage, on being informed of the contents of this opinion, called a conference on June 19, 1902, in San Francisco, which was attended by Commissioners Stephens and Weinstock, representing the State Board of Horticulture, M. J. Dillman, Chairman of the Board of Supervisors of Sacramento County, and Professors Woodworth and Clarke, entomologists of the California University.

The objection of the cattlemen of El Dorado and Placer counties to the indiscriminate burning-over of their pasture lands was discussed, and it was agreed that they should be remunerated by the State. Governor Gage, considering the necessity of immediate action, stated that he would recommend to the next Legislature the passage of a bill appropriating a sum not exceeding $10,000, to pay the claims of owners of land in Sacramento, El Dorado, and Placer counties that might be burned over by orders of the State Board of Horticulture in its endeavors to destroy the grasshoppers.

A line of action was then agreed on, whereby an agreement was to be entered into with the owners of lands on which the grass was proposed to be burned, specifying the number of acres, situation of the land, to whom belonging, and the agreed value of the damage to said land per acre. The grass on said lands should be burned by the authority of the State Board of Horticulture, under the immediate advice and direction of Professors Woodworth and Clarke, but under no circumstances should any land be burned over or other property damaged except under the terms of the agreement. The Secretary was instructed to proceed, in company with Professors Woodworth and

Clarke, to inspect the lands in Placer, Sacramento, and El Dorado counties infested with grasshoppers, and to enter into agreements with the owners in accordance with the above terms and then have burned the grass on such lands.

On June 20, 1902, a conference, attended by Commissioners Stephens and Weinstock and Secretary Keegan of this Board and Professors Woodworth and Clarke, was held in the rooms of the Board at Sacramento. It was shown that the proposed line of action was not authorized by any statutory law, and that the parties authorizing the setting of fire would be held responsible for all damage (which might amount to thousands of dollars) that might accrue other than that specified in the agreement, such as, for instance, the burning of buildings, fences, crops, etc., in the event of the fire getting beyond control.

Mr. Kaseburg, owner of 17,000 acres of land in Placer County, 1,200 acres of which it was proposed to burn over, was present at the meeting, and positively refused to enter into any agreement for the burning of any grass on his land, but said that, like a good citizen, he would submit. He gave as his reason his fear of fire, and most graphically related his terrifying experience with a former field-fire which had swept over his ranch, and that the citizens of Roseville, in fear of the destruction of their town, had moved their household goods into the streets in the hope that they might be able to preserve them from destruction by the threatening field-fires. He had lost two residences by fires in former years.

As it would have been useless to burn the grass on small tracts, allowing that on the larger areas to remain as a menace, and there being no assurance that any owners would consent to the burning of grass on their lands, the Board, after consultation, decided to fight the pests by means of "hopper-dosers," which would inflict damage on no one, and which have proved highly effective in the past, being recommended by the Agricultural Experiment Stations in the States afflicted with grasshoppers and by the United States Department of Agriculture.

It was decided to have a number of "hopper-dozers" made immediately, to be furnished free on application, the farmers to furnish the teams and men to operate them. The Board had constructed twenty-five "hopper-dozers," at a cost of $77. But three applications were received for "hopper-dozers" during June, from parties in the threatened localities.

From the fact that so few applications were received for these "hopper-dozers," or other measures, or seeking advice for relief from grasshoppers, by the farmers and horticulturists, the parties subject to injuries, it is a reasonable surmise that there was no necessity for such drastic measures as setting fields afire at the dry season of the year, and that the action of this Board was most beneficent for the good of the entire community and proved to be ample to afford the necessary protection without doing injury to any, or jeopardizing itself and costing the State thousands of dollars for damages. Besides, the destruction of the grass would have entailed great hardship on the owners of livestock when they returned their herds in the fall from the high Sierras where they annually summer-pasture their stock.

I have written to a number of Boards of Agriculture and Horticultural Societies in the different States for copies of their reports to complete to date those that we now have on the shelves of the library, a number of which are missing, and many have been received.

I have also written to the Directors of all the Agricultural Experiment Stations of the United States, requesting them to send any bulletins they could spare on botany, field experiments, horticulture, diseases of plants, irrigation and drainage, mycology, and entomology. These works I consider of the greatest value, and a large number have been received, arranged under proper classification, and prepared for binding.

The books on the shelves of the library have been arranged, classified, and numbered, and a catalogue is now being prepared, giving each book its number, shelf, and division. It is now nearly ready for the typewriter, only waiting to be alphabetically arranged.

On July 19, 1902, Alexander Craw, Quarantine Officer and Entomologist, rendered a synopsis of his semi-annual report, giving an interesting account of the transactions of his department. It will be found under its appropriate heading in this report.

The asparagus rust (*Puccinia asparagi*) has almost entirely destroyed the asparagus industry in many of the Eastern States, and is constantly and rapidly spreading. Our efficient Quarantine Officer, Mr. Craw, appreciating the danger to asparagus-growers in this State, has taken hold of the matter, and addressed the following letter to this Board:

SAN FRANCISCO, July 16, 1902.

To the State Board of Horticulture, Capitol Building, Sacramento, Cal.:

GENTLEMEN: My attention has been called, by the Hickmott Asparagus Co. of this city, to the danger of introducing the destructive asparagus disease, or rust (*Puccinia asparagi*), into California upon asparagus roots or seeds from Europe, or east of the Rocky Mountains. Hundreds of thousands of dollars have been invested in asparagus culture, canning plants, etc., and the introduction of such a disease would be a serious blow to the industry.

I fear that detention or disinfection of the plants or seeds would not be sufficient to prevent the introduction of the fungi spores. I would therefore suggest that you submit the question to the Attorney-General for his opinion as to your powers to draw up a regulation absolutely prohibiting the bringing of asparagus seeds or plants from Europe or any of the United States or Territories into California. To exempt the Pacific Coast States would simply leave the doors open for indifferent or unscrupulous parties to bring such stock through those States.

I took the precaution to call public attention, through the press, to this danger. I herewith inclose a letter from Dr. A. F. Woods, United States Pathologist and Physiologist, Washington, D. C. Therein he shows how rapid its spread has been since its introduction into New Jersey in 1896.

Respectfully yours,

ALEXANDER CRAW,
Quarantine Officer, State Board of Horticulture.

The following letter, addressed to Mr. Craw, from A. F. Woods, Pathologist and Physiologist, U. S. Department of Agriculture, in response to a letter from Mr. Craw requesting information regarding asparagus rust, was received:

WASHINGTON, D. C., May 13, 1902.

MR. ALEXANDER CRAW, *State Board of Horticulture, San Francisco, Cal.:*

DEAR SIR: Your letter of May 6th, requesting information regarding asparagus rust in the Eastern States and the advisability of establishing quarantine regulations to prevent its introduction into California, has been referred to Mr. W. A. Orton, of this office, whose report follows.

The asparagus rust, which is caused by the attack of a fungus (*Puccinia asparagi*, DC.) is a native of Europe, and was first introduced into this country in New Jersey in 1896. In the four succeeding years it has spread over the whole eastern and central United States, doing an immense amount of damage, especially in the extensive trucking sections of the Atlantic coast from Massachusetts to South Carolina. It now occurs as far west as Nebraska and the Dakotas, and while we have no authoritative report on the subject from many States, it is probable that it occurs nearly everywhere east of the Rocky Mountains. There are doubtless individual farms in many places that are free from it, but all asparagus from any Eastern or Central State would be open to more or less suspicion.

The disease was reported from near Sacramento, Cal., in February, 1880, by Dr. Harkness, in his "Catalogue of the Pacific Coast Fungi." No specimens were preserved, and we have no further report from the State and no other reason to think that it still exists there.

The epidemic of rust in the East, which almost ruined the industry in many places, is now much abated, and less difficulty is experienced in controlling the disease, though it annually causes much loss. It seems to continue to be destructive in the West.

As regards the policy of your Board in its attempt to prevent the introduction of the disease into California, we hesitate to advise definitely, not being acquainted with you laws on the subject. It will be a difficult task for you to keep the rust out of California though rigid enforcement of the proper rules may long delay its introduction. The greatest danger lies in the introduction of the rust in young plants from the East, and to make any quarantine effective, the importation of asparagus roots or plants from east of the Rocky Mountains would have to be entirely prohibited. We are not informed as to whether the California growers now purchase any plants from the Eastern States, but, if this is done, it will be practically impossible to avoid the introduction of the disease in the near future, on account of its general distribution throughout the Eastern States.

It will be impossible, in actual practice, to determine from an examination of roots of young plants whether or not they are affected by rust, as the fungus lives inside the tissues of the plants and does not appear on the outside until the plant is nearly grown, when it bursts through the stem and leaves to form spores, in much the same way that the grain rusts do. It is therefore evident that no distinction can be made between healthy and diseased plants as far as importations into California are concerned. The importation of asparagus seed from infected districts will also be attended with considerable risk. It is not probable that the rust fungus exists inside the seed, even though it came from diseased plants, but in the process of gathering and cleaning the seed, it will be very likely to come into contact with the rusty branches and get covered with the spores of the fungus. Such seed could be safely admitted if it were disinfected by soaking two hours in formalin (40 per cent formaldehyde), 1 part to 100 of water, and then dried and put up in a new package.

If we can advise you further in this matter, we shall be very glad to do so.

Yours very truly,

A. F. WOODS,
Pathologist and Physiologist.

Acting on the suggestion of Mr. Craw, I submitted the question to the Attorney-General, requesting his opinion as to the power of this Board to pass a regulation absolutely prohibiting the bringing of asparagus plants or seeds from Europe or any of the United States or Territories into California. The following is the opinion of the Attorney-General:

SAN FRANCISCO, CAL., September 12, 1902.

MR. J. J. KEEGAN, *Secretary State Board of Horticulture, Sacramento, California:*

DEAR SIR: I am in receipt of yours of July 24, 1902, wherein you request my opinion as to the power of your Board to adopt regulations absolutely prohibiting the importation of asparagus plants or seeds, from Europe or any of the states or territories of this Nation, into this State. You inclose communications and literature, indicating the likelihood of disease to the domestic asparagus plants, from the importation of foreign plants and seeds.

In reply thereto, would say that the State Board of Horticulture has the power to adopt regulations forbidding the introduction into the State, of asparagus plants and seeds that are infested with pests or which come from districts where asparagus plants and seeds are subject to such pests, but has not the power to absolutely exclude all asparagus plants and seeds from being brought into the State.

* * * * * * * * * * * *

Ex Parte Cox, 63 Cal. 21.

The power of the Board in the premises does not extend much further than the authority expressly conferred upon the State horticultural quarantine officer by the Act of 1899. (Statute 1899, p. 91.) In arriving at these conclusions, I would cite

Railroad Co. vs. *Husen*, 95 U. S. 465;
Rasmussen vs. *Idaho*, 181 U. S. 198;
Schollenberger vs. *Pennsylvania*, 171 U. S. 1;
Smith vs. *Railway Co.*, 181 U. S. 248.

Very truly yours,

TIREY L. FORD, Attorney-General,
By A. A. MOORE, JR., Deputy.

The matter was brought before the Executive Committee at a meeting held September 25, 1902. Telegrams were received, asking the Board to take prompt and radical action to protect and preserve this important growing industry of California. R. H. Hickmott, a grower having 1,000 acres of asparagus on Bouldin Island and also engaged in canning asparagus, appeared before the meeting and urged that all asparagus plants and seeds raised elsewhere be excluded from the State, for he feared that many plants would be imported in the near future because of the great success that has attended its culture in this State. After carefully considering the matter, it was decided that the only effective manner to protect the valuable and growing industry of asparagus-raising was to prohibit the introduction of asparagus plants or seeds into the State altogether. The following resolution was adopted:

Resolved, All asparagus roots and seeds raised in any place outside the boundaries of the State of California are hereby prohibited from being planted or offered for sale, gift, or distribution within the limits of the State of California.

The widest circulation possible was given to the above resolution.

Circular letters, containing the resolution and a synopsis of the letter of A. F. Woods, were printed and forwarded to the horticultural officers in the various counties, requesting that they be addressed to and placed in the hands of all nurserymen and seedsmen. It is confidently hoped that this timely action of the Board will prevent the introduction of the asparagus rust into this State, which would certainly destroy one of the most promising and remunerative agricultural industries of the State.

On September 12, 1902, a notice was received from H. Weinstock, that he had sent his resignation as a member of the State Board of Horticulture to Governor Gage on August 1, 1902. As he was also Treasurer of the Board, it was necessary, for the transaction of business and the prompt payment of bills, that his successor should be elected or appointed. As there was no quorum present at the meeting of the Board called for September 25, 1902, President Cooper, by the power vested in him by Section 15 of the Statute of 1889, appointed R. D. Stephens, of Sacramento, Commissioner for the State at large, as Treasurer of this Board. The consent of the Executive Committee of the Board to the appointment was given. Mr. Stephens immediately filed his bond and oath of office, and promptly paid the bills which had accumulated since June 30, 1902.

Mr. Weinstock submitted his report as Treasurer of the Board from June 30, 1901, to June 30, 1902. It showed that there had been received $6,288.31 and disbursed $6,258.30, leaving a balance of $30.01, for which a check payable to the State Board of Horticulture was presented. Of this total amount of disbursements, $1,926 was paid out in accordance with an Act making an appropriation to pay the claim of the State Board of Horticulture for moneys expended in behalf of the State of California, approved February 28, 1901.

In conclusion, I desire to express my sincere thanks to Commissioner R. D. Stephens, Chairman of the Executive Committee of this Board, for the aid he has given me in the discharge of my duties by his timely advice and counsel, which have always been willingly given; and having implicit confidence in his sagacity and ability, I have invariably followed the same, with benefit to the interests of the Board and State.

The following tables show the expenditures of the State Board of Horticulture for the fifty-second fiscal year ending June 30, 1901, and for the fifty-third fiscal year ending June 30, 1902. The accounts have been examined by the Executive Committee of the Board and compared with the Controller's books, and found to be correct:

Expenditures of the Appropriation for the Support of the State Board of Horticulture for the Fiscal Year ending June 30, 1901.

Twenty-fifth Fruit-Growers' Convention	$272 35
Books and papers	14 00
Chemicals, etc.	53 73
Extra help	547 10
Express	58 85
Freight and cartage	19 09
Furniture and repairing	113 22
Janitor	180 00
Miscellaneous	288 47
Postage	606 38
Salary of Deputy Quarantine Officer	845 00
Salaries of Special Agents	960 75
Traveling expenses of Deputy Quarantine Officer	73 60
Traveling expenses of Secretary	287 50
Traveling expenses of Quarantine Officer	91 15
Traveling expenses of Commissioners	450 48
Telephone and telegrams	151 57
	$5,013 24

Unexpended, fifty-first fiscal year	$13 24
Appropriation	$5,000 00
	$5,013 24
Expenditures, fifty-second fiscal year	5,013 24
Balance	None.

Expenditures of the Appropriation for the Support of the State Board of Horticulture for the Fiscal Year ending June 30, 1902.

Chemicals	$18 10
Extra help	281 09
Express	67 37
Fruit-Growers' Convention	276 65
Furniture and repairing	249 40
Freight and cartage	22 47
Janitor	180 00
Library	69 25
Miscellaneous	298 85
Postage	299 85
Salary of Special Agent	720 33
Salary of Deputy Quarantine Officer	30 00
Traveling expenses of Special Agent and Deputy Quarantine Officer	244 00
Traveling expenses of Quarantine Officer	146 30
Traveling expenses of Commissioners	436 05
Telephones and telegrams	101 45
	$3,441 16

Appropriation	$5,000 00
Expenditures, fifty-third fiscal year	3,441 16
Balance	$1,558 84

Expenditures of the Appropriation for Sending an Expert to Foreign Countries to Collect, Import, and Distribute Parasitical and Predaceous Insects.

Salary of George Compere (paid) from July 15, 1899, to March 31, 1901, 20½ months at $125	$2,562 50
Receipt July 17, 1899, by George Compere (expenses)	2,000 00
Receipt May 9, 1900, by George Compere (expenses)	502 50
Cable November 12, 1900, for (expenses)	500 00
Cable, March 27, 1901, for (expenses)	270 00
Draft for $500 sent to Yokohama to George Compere, October 25, 1900. Did not reach him in time, was returned with charge of	7 50
Receipts for expenditures charged to this account	60 83
Postage	200 00
George Compere, balance paid	483 50
Expenditures for which no vouchers can be found	913 17
	$7,500 00
Appropriation	$7,500 00

Expenditures of the Appropriation for Printing, Binding, Ruling, and All Other Work Performed and Materials Furnished by the State Printing Office to State Board of Horticulture.

Unexpended appropriation, fifty-first fiscal year	$1,000 00
Appropriation for fifty-second fiscal year	2,500 00
	$3,500 00
Expenditures, fifty-second fiscal year	3,500 00
Balance	None.
Expenditures, fifty-third fiscal year ending June 30, 1902	$2,500 00
Expenditures under Act of February 28, 1901	$1,895 99
Unexpended balance	30 01
Total	$1,926 00

Respectfully submitted.

J. J. KEEGAN,
Secretary and Chief Horticultural Officer.

REVIEW OF THE FRUIT SEASONS.

The seasons of 1901 and 1902 have both been good ones for the fruit-growers, so far as productiveness is concerned. There had been no serious pests in the orange sections, and the year 1901 opened with heavy shipments of citrus fruit, which increased in volume as the season advanced and continued so late in the season that the new and the old crops were being shipped at the same time and there was no well-defined break between the two orange seasons; but for the sake of reference the new season is presumed to commence on the first of November.

There was a fairly good output of deciduous fruits, although much damage was done by early April frosts, which killed off much young fruit and severely injured blooming trees. Cherries and apricots especially suffered, while in some sections peaches were badly injured. The greatest damage, however, was confined to a comparatively limited area, and the shipments of fresh deciduous fruits for the season exceeded 170,000,000 pounds.

In some sections grapes were injured by late frosts, which caught them in full bloom; and some sections reported almost a total loss of crop from this cause.

Apples turned out unusually well all over the State, shipments from the Pajaro Valley being the largest on record. A shortage in the Eastern crop had made a heavy demand for Pacific Coast fruit, which was shipped in large quantities to the East and to Europe.

The olive crop over the whole State was phenomenally heavy, the largest crop in the history of that fruit in California having been produced.

Prunes fell below normal in quantity. A succession of dry years in the Santa Clara Valley, which is the center of the prune industry, had the effect of lowering the water table in the land, leaving the roots dry in many cases and the trees with insufficient moisture. As a result, many trees died and many more bore a light crop of inferior fruit.

THE SEASON OF 1902.

The season of 1902 opened under more favorable auspices. Seasonal rains had been abundant, orchards were generally in good condition, and there was every promise of the heavy fruit crop that was realized later in the season.

The orange crop of the northern counties had all been marketed before the opening of the year, and heavy shipments were going forward from the southern counties. A severe north wind in the latter part of December did an immense amount of damage in the orange groves of the south, some reports stating that the loss of fruit amounted to nearly one third of the crop. This, with other unfavorable climatic conditions, resulted in a heavy falling off in orange shipments this year as compared with those of last season. Winter irrigation in this section was very generally followed. Several dry seasons in succession taught the fruit-growers to take advantage of all the water they could secure and to fill up the land in the winter as a precautionary measure against another season of short rainfall.

The State was unusually free from killing frosts during the last winter and entirely escaped them in the spring. A destructive frost is generally expected from the 1st to the 20th of April, when the deciduous trees are in bloom. If not too severe, this serves to remove the redundant bloom and is often regarded as beneficial rather than injurious; but, if too severe, it may very materially shorten the fruit crop and the income of the orchardist. This season we escaped this visitation entirely, and as a result the crop of deciduous fruits was one of the heaviest on record in the State. Another climatic condition favorable to the fruit crop was the cool weather in the latter part of January and through the month of February. Warm weather, so common in February, starts the sap flowing and forces the early blooming of deciduous trees, rendering them extremely sensitive to a later cold snap. This year we fortunately escaped both the warm weather of February and the frosts of April.

Cherries.—Owing to the cool weather in the early part of the season, fruit shipments this year were from two to three weeks later than usual, and the first shipment of cherries was made from Vacaville on April 25th by Frank H. Buck, who consigned the fruit to Porter Brothers, Chicago.

The first shipment of cherries usually consists of a ten-pound box, but this year, notwithstanding the lateness of the season, it was difficult to find even that quantity, and a three-pound box was forwarded, for the ripening process, though late, had begun. The three-pound box was sold in Chicago on Tuesday, April 29th, for the sum of $3—a dollar a pound, the usual price for the first cherries in that market.

This shipment was soon followed by larger ones, and early in May cherries began to go forward in carload lots. The first full carload from the Santa Clara Valley went forward on May 26th, fully two weeks later than in a normal season.

The crop was an exceptionally heavy one, one of the heaviest, in fact, ever produced in the State. A very large part of the crop went to the canneries, while 245.75 carloads were shipped to the Eastern market, against 98.50 cars for 1901—an increase of 147.25 carloads.

The first shipment of cherries from this State in 1901 went forward on April 11th; in the year 1900, on April 9th; in 1899, on March 31st; in 1898, on April 15th; in 1897, on April 26th; and in 1896, on April 12th; all from Vacaville.

Apricots.—Early reports from the apricot sections were conflicting. A heavy rain during the blooming season, it was claimed, had washed the pollen out of the blossoms, and that, in consequence, the fruit had not set well and the crop would be light. From other sections it was reported that the fruit was setting so thick that vigorous thinning would be needed to insure a crop of marketable sizes. The result has been a very good crop in nearly all sections, and in most localities severe thinning was necessary. In Southern California the apricot crop was one of the heaviest on record. Apricots appeared in the market late in May, and Eastern shipments soon followed, some small express shipments being made during the first week in June. By the middle of June the rush of Eastern shipments was on, and continued until the season was over, by which time 221.75 cars had been shipped, against 177.50 for the preceding year—a gain of 44.25 cars. A very large percentage of the crop was dried, although much of it was used by the canneries. The crop was so large that the canners advanced their standard and would accept nothing but the best fruit, no inferior fruit having been put up this year.

Pears have been a good average crop in all the counties north of the middle of the State. Below that line, pear-blight has wrought such destruction in the orchards as to practically remove the pear from further consideration. Fortunately this destructive disease has not yet obtained a foothold in our principal pear-growing districts, and therefore the losses in the affected districts do not materially influence the general result. The crop has been a good one, the fruit of superior quality, and Eastern shipments have been heavy, footing up 1,856.25 cars, against 1,475.75 cars for 1901. Prices for the fruit ranged very low during the season, and as a result very much of it found its way to the drying-grounds.

Apples have not been a full crop. There was a very material shortage in the Pajaro Valley and at Lompoc, while few, if any, of the apple sections have reported a full crop. Greater care has been exercised this season, by both pear and apple growers, in fighting fruit pests, especially the codling-moth, and as a result, this fruit has been more free from worms and of better quality. Eastern shipments up to the present writing have fallen off from last year, being, to September 30th, 116.75 carloads, against 173.75 for last year—a decrease of 57 cars. The bulk of the fruit yet remains to be shipped, and large quantities will continue to go forward for several months to come. The Pajaro Bellefleur crop is not running to small sizes. Four-tier stock is general, and even larger sizes in quantity. The crop is not going to show as many carloads as last year, notwithstanding the number of young trees in bearing for the first time this year. A conservative packer, whose estimates have come very close to crop results, says that the Bellefleur crop will not run much, if any, over 500 carloads of good merchantable stock, suitable for trade out of the State. Last year the shipments of Bellefleur apples out of the State aggregated 650 carloads.

Peaches have been at least a full average crop, running to large sizes. In many of the peach sections the trees were so heavily loaded early in the season that vigorous thinning was necessary to insure fruit up to the standard of the canneries. In some sections, the peach-moth (*Anarsia lineatella*) was more than usually destructive, and wormy peaches were common. There was a good demand for peaches at the canneries and a large pack has been put up. Eastern shipments have fallen somewhat under those of last year, being 1,757.2 cars, against 1,889.25 cars for the preceding year—a falling off of 132 cars up to October 1st.

Grapes have been somewhat spotted, but as a rule the crop has been a good one and some sections report it as very heavy. In some districts phylloxera and the Anaheim disease are reported, and where these pests obtain the output has been materially affected. In the raisin districts the output has been a full average. There has been a very active demand for wine grapes this season, and this, combined with the low price of raisins and the scarcity of labor, has had the effect of sending large quantities of raisin grapes to the wineries, and it is probable that the season's pack will fall below normal.

Prunes have turned out a much larger crop this year than in 1901, and from most sections they have been reported as a very heavy crop. In the Santa Clara Valley, however, which produces the great bulk of the prune crop, the yield has been below normal, and runs very much to small sizes. On the dry lands very many trees have died out during the last four years from insufficient rainfall, and a much larger number have been affected thereby. Prices for cured prunes have opened up very low, and the present outlook for this fruit is not encouraging.

The Fig.—The successful introduction of the *Blastophaga*, or fig-fertilizing insect, promises to revolutionize the fig industry of this State and to make an opening for a new and important branch of horticulture here. After many years of effort and the expenditure of vast sums of money, the fig wasp is now thoroughly established, has been carried through several seasons, and may be regarded as completely acclimatized. Smyrna figs are being successfully produced in commercial quantities and are being shipped in bulk for the first time in our history. Large plantings of these figs have been made in different parts of our State, and in a few years the fig of commerce will take its place with other fruits in the export list of California productions. The greater part of the credit for this is due to the indefatigable labors and liberal expenditures of George C. Roeding, to whose efforts we also owe the successful introduction of this insect.

Almonds have produced a very good crop in most sections. The absence of frost in the late spring months, when the fruit was setting, was very favorable for a crop of these nuts, and the yield from most orchards was reported as being from fair to very good.

Walnuts have done better this year than they did last, and a good crop was reported, especially from the southern counties. The brown spot of the walnut, which damaged a large percentage of the crop in 1901, has not been so prevalent this year, and while some nuts have been injured by it, the crop as a whole may be classed as a good one of superior quality.

Small Fruits, Berries, etc., have yielded very heavily, and an unusually heavy pack of all varieties has been put up by the canneries during the past season.

Taking the season as a whole, it may be said that it has been one of the best fruit years ever known in California. There have been drawbacks in some localities; some kinds of fruit in spots have not come up to the average; but, taken altogether, the fruit-growers of California have little complaint to make of the season just passed, so far as crops are concerned.

MOVEMENTS OF FRUITS.

Fresh Deciduous Fruits.—Shipments of fresh fruit out of the State up to November 5th of this year, exceeded those of 1901 by 823 carloads, although the shipping season was nearly three weeks later in starting than was that of the preceding year. Shipments for the present season as compared with the preceding year, according to the California Fruit-Grower, are as follows:

Shipments of California Deciduous Fruits East—Seasons of 1901 and 1902 to November 5th.

Deciduous Fruits.	1901.	1902.
	Cars.	*Cars.*
Cherries	98½	245¾
Apricots	177½	221¾
Peaches	1,892½	1,777
Plums	977¼	1,480¼
Pears	1,535¼	2,003
Grapes	944	970¾
Apples	540¾	309½
Mixed	39¼	20
Totals	6,205	7,028

Itemized Fresh Deciduous Fruit Shipments.

From north of Tehachapi only. In carloads. To December 1.

Destination.	1895.	1896.	1897.	1898.	1899.	1900.	1901.
New York	862	1,055	1,456	1,430	1,694	1,527	1,482
Chicago	1,473	1,007	1,410	1,203	1,060	1,101	1,273
Boston	279	471	543	536	710	649	639
Philadelphia	82	90	202	176	339	212	257
Minneapolis	124	147	180	167	247	302	275
Omaha	176	85	165	156	194	240	205
St. Paul	109	91	121	67	125	131	108
Montreal	44	81	98	96	128	126	128
Denver	148	136	98	229	269	233	246
Kansas City	91	81	86	116	165	129	85
New Orleans	75	85	81	62	126	136	118
St. Louis	78	68	59	27	115	79	64
Milwaukee	42	32	52	19	60	68	62
Pittsburg	26	25	40	47	137	144	167
Cleveland	29	10	73	25	83	63	58
Cincinnati	15	2	20	15	89	35	29
Baltimore	37	5	16	16	67	34	23
Buffalo	15	7	15	5	34	10	32
England and Scotland	....	42	58	42	121	199	93
Germany	....	....	....	....	2	....	16
Mexico	....	....	....	1	1	....	....
Other points	863	532	586	572	1,103	1,017	1,098
Totals	4,568	4,052	5,323	5,007	6,869	6,435	6,459

Varieties of Fruit Shipped.

In carloads.

Variety.	1895.	1896.	1897.	1898.	1899.	1900.	1901.
Pears	1,187	1,624	1,640	1,595	1,684	2,115	1,535
Peaches	1,289	976	1,316	1,103	2,625	1,361	1,901
Grapes	1,010	712	1,100	734	847	825	966
Plums and prunes	465	407	742	542	885	1,158	936
Cherries	180	88	239	297	85	238	110
Apricots	162	172	177	123	90	152	201
Apples	105	53	61	596	490	512	739
Quinces	13	8	24	1	19	10	13
Nectarines	5	1	10	....	2	....	2
Figs	....	2	3	....	....	....	....
Persimmons	....	....	2	1	1	3	2
Mixed	152	9	9	15	24	27	23
Cars not reported	....	....	....	....	117	34	31
Totals	4,568	4,052	5,323	5,007	6,869	6,435	6,459

The fresh fruit season of 1901 was a remarkable one. While the crop was not large, growers did well, owing to fair crops, uniformly high prices in the East, greatly improved transportation facilities, and a reduction in the charges for refrigeration which became effective on April 15th.

Interstate Shipments of Fresh Deciduous Fruits.

	Pounds.
1890	74,646,000
1891	98,680,000
1892	111,689,000
1893	159,900,000
1894	179,576,000
1895	132,587,000
1896	115,300,000
1897	145,250,000
1898	139,550,000
1899	193,900,000
1900	182,375,000
1901	187,346,000
1902 (estimated)	192,000,000

Citrus Fruits.—Shipments of citrus fruits have fallen off as compared with former years, the total being 24,900 carloads for 1900–01 and 19,180 carloads for 1901–02—a falling off of 5,720 carloads. The conditions of the present year promise a much larger crop than the last, although it will not probably reach the phenomenal figures of 1901. Experts who have carefully examined the citrus fields estimate the new crop of citrus fruits at 20,000 carloads. For the season November 1, 1900, to October 31, 1901, there was a movement of 24,900 cars of citrus fruits, or 8,964,000 boxes, of which about 3,200 cars, or 992,000 boxes, were lemons.

California Orange and Lemon Crop.

Season.	Carloads.	Boxes.
1892–93	5,871	1,972,500
1893–94	5,022	1,687,500
1894–95	7,575	2,545,200
1895–96	6,915	2,323,500
1896–97	7,350	2,469,600
1897–98	15,400	5,174,400
1898–99	10,875	3,654,000
1899–00	18,400	6,624,000
1900–01	24,900	8,964,000
1901–02	19,180	6,904,800

That there is yet an unsupplied home market for much citrus fruit is shown from the fact that in 1901–02 we imported 52,742,476 pounds of oranges, valued at $784,640, and 164,182,952 pounds of lemons, worth $3,327,781. The following table gives the importations of these principal citrus fruits from 1895–96; prior to 1899–00 values only were available:

Receipts of Foreign Oranges and Lemons.

Season.	ORANGES.		LEMONS.	
	Pounds.	Value.	Pounds.	Value.
1895–96		$2,694,131		$5,040.344
1896–97		2,324,907		4,043,822
1897–98		886,722		2,848,130
1898–99		1,097,596		4,398,004
1899–00	68,618,818	1,087,041	160,197,966	3,666,881
1900–01	50,332,914	716,457	148,514,614	3,516,850
1901–02	52,742,476	784,640	164,182,952	3,327,781

Prunes.—The California prune holds its place in the front ranks of the fruit products and exports of the State. It has had many vicissitudes in the past few years, and especially in the past two seasons; owing to these unfavorable conditions, the total output has fallen off somewhat, but it remains one of the most important factors in the wealth-producing products of the State. The growth of the industry has taken place within the past thirty-five years, the first shipment of dried prunes having been made from San José in 1867. From that period it grew steadily, until it reached its maximum in 1900, when 174,000,000 pounds were produced. The production by years from 1890 is given below:

Prune Yield of California.

	Pounds.
1890	16,000,000
1891	27,500,000
1892	22,500,000
1893	52,180,000
1894	44,750,000
1895	64,750,000
1896	55,200,000
1897	97,780,000
1898	90,420,000
1899	114,227,000
1900	174,000,000
1901	81,600,000
1902 (estimated)	160,000,000

With our enormous output it became necessary to find a wider market for our fruits, and we have invaded Europe, sending our fruit even to France and Germany, the home of the prune, where large quantities have been sold in the past few years, and where this fruit is continually growing in favor, owing to its superior quality. Since 1897 we have exported prunes as follows:

Quantity and Value of Exports of Prunes.

Fiscal Year.	Pounds.	Value.
1897-98	15,940,791	$1,021,888
1898-99	5,615,565	380,847
1899-00	25,922,371	1,646,332
1900-01	10,021,564	589,113
1901-02	23,358,849	1,404,422

Quantity and Value of Foreign Prunes Imported.

Fiscal Year.	Pounds.	Value.
1890-91	34,281,322	$2,054,486
1891-92	10,869,797	437,271
1892-93	26,414,112	1,162,318
1893-94	9,908,122	416,342
1894-95	14,352,057	527,625
1895-96	483,658	68,862
1896-97	710,020	73,303
1897-98	303,992	39,660
1898-99	600,360	63,574
1899-00	443,457	47,700
1900-01	745,974	62,880
1901-02	522,478	44,077

Raisins.—The raisin pack has fallen off during the past two years, owing largely to low prices and dullness of the market. From these causes the fruit has been forced into another channel, and very much that should have gone onto the drying-trays has found its way to the winery and distillery. Another reason for the shortage in the pack this season will be found in the scarcity of labor. During the picking and drying period it was impossible to secure help to handle the crop, and much of it was rushed to the wineries in order to save it. The raisin pack reached its maximum in 1894, when 103,000,000 pounds were cured. This figure has never since been reached. The figures for the output of the past ten years are given below:

California Raisin Pack.

	Pounds.
1892	57,000,000
1893	85,000,000
1894	103,000,000
1895	91,360,000
1896	68,250,600
1897	93,704,000
1898	80,631,000
1899	71,568,000
1900	94,325,000
1901	74,000,000
1902 (estimated)	100,000,000

The importations and exports have been as follows:

Quantity and Value of Raisins Exported.

Fiscal Year.	Pounds.	Value.
1897–98	3,109,639	$167,062
1898–99	4,659,807	242,620
1899–00	2,415,456	139,689
1900–01	3,530,164	218,715
1901–02	2,323,274	149,216

Quantity and Value of Raisins Imported.

Fiscal Year.	Pounds.	Value.
1892–93	27,543,563	$1,266,342
1893–94	13,751,050	554,081
1894–95	15,921,278	651,420
1895–96	10,826,094	460,200
1896–97	12,650,598	567,039
1897–98	6,593,833	381,889
1898–99	4,933,201	282,400
1899–00	10,309,498	531,124
1900–01	3,860,876	297,631
1901–02	6,563,302	392,551

The Fig.—While we may look for a great increase in the fig pack of the future, due to the introduction of the *Blastophaga grosorum* by George C. Roeding, fig production in the past has not been an insignificant part of our fruit industry, as will be seen from the following table.

These figs include the California blacks, white Adriatics, and other inferior drying varieties:

California Cured Fig Output.

	Pounds.
1891	360,000
1892	500,000
1893	900,000
1894	1,540,000
1895	2,750,000
1896	2,160,000
1897	3,250,000
1898	4,780,000
1899	5,800,000
1900	6,000,000
1901	6,500,000
1902 (estimated)	7,250,000

The importation of Smyrna figs, which we hope soon to be able to replace with our California product, as will be seen from the subjoined table, is an item of considerable importance; of the figs imported, Asiatic Turkey sends us an average of 70 per cent. About 21 per cent of the imports of this fruit come from the United Kingdom, taking the average of the past five years, most of which, however, is of Turkish production.

Quantity and Value of Figs Imported.

Fiscal Year.	Pounds.	Value.
1890-91	9,201,565	$697,562
1891-92	8,338,759	511,142
1892-93	10,503,928	548,995
1893-94	7,985,959	393,040
1894-95	11,855,890	587,420
1895-96	11,900,710	639,512
1896-97	8,940,762	535,380
1897-98	9,628,426	509,002
1898-99	7,284,058	356,762
1899-00	8,812,487	513,895
1900-01	9,933,871	458,513
1901-02	11,087,131	487,733

Apples.—A steadily growing interest is being manifested in the apple, which has practically sprung into prominence in the past few years. It was always conceded that there were sections in this State where good apples could be grown, but this fruit was relegated to the background as a commercial proposition. Recent years, however, have demonstrated the fact that there are vast areas of good apple land in California, combined with climatic conditions suitable to the growth of that fruit, and the industry has forged ahead, until to-day apples count as an important item in our fruit exports. The fact that nearly one half the apple trees in this State are not yet of bearing age indicates the extent to which apple-planting has been followed in the past few years. There are now in orchard in California 2,120,595 apple trees, of which 1,586,241 are in bearing and 534,354 are not. Allowing 48 trees to acre, the usual number of apple trees, and we have 44,179 acres in apples. It would be perfectly safe to add 10 per cent to these figures, as there are many small orchards which escape notice. California is now an important shipper of apples, the larger part going from the Pajaro Valley and finding their way to the Eastern States and Europe. Large shipments are also made to China, Japan, Australia, Hawaii, the South Sea Islands, and South America.

Pajaro Valley Apple Shipments.

State, Interstate, and Export.

Season.	Cars.	Boxes.
1897-98	765	512,550
1898-99	953	638,510
1899-00	1,300	871,000
1900-01	1,500	960,000
1901-02	2,200	1,408,000

Exports of California Apples.

(In boxes.)

New York to—	1899-00.	1900-01.	1901-02.
Liverpool	58,922	61,602	109,715
London	70,724	107,752	153,653
Glasgow	13,118	22,415	20,449
Hull	4,826	7,000	9,681
Hamburg	1,925	1,325	2,929
Totals	149,515	200,094	296,427

Nuts.—The two principal nut crops of California are walnuts and almonds, and while most species of nuts are produced here in greater or less quantities, these alone are grown in quantities of commercial importance, and of these the walnut heads the list. The output of walnuts in this State since 1895 is shown in the following table:

California Walnut Production.

	Pounds.
1895	6,770,000
1896	12,400,000
1897	9,620,000
1898	12,200,000
1899	15,800,000
1900	16,340,000
1901	13,800,000
1902 (estimated)	17,500,000

Almond and Walnut Production, by Carloads.

	Almonds.	Walnuts.
1898	45 cars	565 cars.
1899	232 cars	558 cars.
1900	274 cars	543 cars.
1901	150 cars	690 cars.
1902 (estimated)	380 cars	875 cars.

Value of Imported Nuts.

Fiscal Year.	Almonds.	All Other.	Totals.
1894-95	$810,439 00	$1,202,405 00	$2,012,844 00
1895-96	763,594 00	1,311,570 00	2,075,164 00
1896-97	880,263 00	1,319,898 00	2,200,161 00
1897-98	659,659 00	1,578,279 00	2,237,938 00
1898-99	1,222,587 00	1,504,955 00	2,727,542 00
1899-00	949,083 00	2,029,751 00	2,978,834 00
1900-01	946,138 00	2,322,463 00	3,268,592 00
1901-02	1,240,886 00	2,803,333 00	4,044,219 00

Dried Fruits.—The dried fruit pack of the State this season was above normal. This is accounted for by the unusually large crop of apricots, peaches, and pears, the low prices offered by the canneries and the exacting demands made by them for fruit of the highest grade only, and the risk attendant upon shipping fresh fruit to the Eastern market. In consequence, more than the usual quantity went to the drying-grounds. The great scarcity of labor during the curing season militated somewhat against the dried fruit pack, or it would have been still heavier. The following table gives the quantity of dried fruit put up in California, by years. Prunes and raisins are not included in this table, as they are treated of under a separate head elsewhere:

Table of the Dried Fruit Output.

	Pounds.
1891	40,210,000
1892	38,200,000
1893	40,840,000
1894	81,720,000
1895	57,960,000
1896	42,775,000
1897	79,110,000
1898	37,400,000
1899	68,500,000
1900	94,580,000
1901	69,225,000

California Dried Fruit Output, by Varieties.

(In pounds.)

Varieties.	1898.	1899.	1900.	1901.
Peaches	10,960,000	34,800,000	34,340,000	29,500,000
Apricots	8,240,000	11,600,000	28,080,000	15,750,000
Apples	3,520,000	5,900,000	6,360,000	6,450,000
Figs	4,780,000	5,800,000	6,000,000	6,500,000
Pears	6,620,000	5,760,000	14,550,000	6,575,000
Plums	2,460,000	3,360,000	3,900,000	3,450,000
Nectarines	180,000	840,000	870,000	650,000
Grapes	640,000	440,000	480,000	350,000
Totals	37,400,000	68,500,000	94,580,000	69,225,000

Canned Fruits.—The season's pack of canned fruits is very heavy and of exceptional quality. The crop of canning fruit was an unusually heavy one, more, in fact, than the canneries could handle, and only the higher grades were accepted. The pack as a whole would have been much heavier had it not been for the great difficulty of securing labor to handle it in the ripening season. Some difficulty was also experienced in getting cans earlier in the season, but this was afterward overcome.

California Canned Fruit Pack.

	Cases.
1890	1,495,300
1891	1,571,200
1892	1,602,370
1893	1,001,640
1894	1,528,815
1895	1,639,807
1896	1,602,446
1897	1,942,982
1898	2,085,166
1899	3,003,171
1900	2,775,896
1901	2,677,072
1902 (estimated)	2,141,657

California Fruit and Vegetable Pack, by Varieties.

	In Cases		
Variety.	1899.	1900.	1901.
Apples	36,655	17,635	15,972
Apricots	722,272	537,091	294,896
Blackberries	23,129	17,040	21,750
Cherries—Royal Ann	------	75,472	28,178
Cherries—Black	6,498	28,827	12,136
Cherries—White	30,434	48,164	11,441
Currants	1,266	614	794
Gooseberries	1,165	1,592	1,371
Grapes	41,776	36,142	41,364
Nectarines	736	765	509
Pears	508,106	611,247	458,305
Peaches—Free	993,124	444,847	559,500
Peaches—Cling		462,121	801,788
Plums	137,413	163,266	137,191
Quinces	712	1,269	749
Raspberries	5,784	1,549	3,555
Strawberries	11,435	7,921	15,782
Total table fruits	2,520,505	2,455,562	2,405,181
Pie fruit, 2½-lb. cases	212,664	110,992	31,817
Pie fruit, gallon cases	216,307	153,236	200,492
Jams and jellies	53,695	56,106	39,582
Total fruits	3,003,171	2,775,896	2,677,072
Tomatoes, 2½-lb. cases	568,061	519,502	704,795
Tomatoes, gallon cases		47,048	43,645
Peas	25,966	57,466	102,089
Asparagus	105,881	143,861	187,592
Beans and other vegetables	38,523	35,740	37,937
Total fruits and vegetables	3,756,602	3,579,513	3,753,130

Exports of California Canned Fruits.

(From San Francisco by sea to England.)

Pack of.	Cases.
1895	272,890
1896	269,779
1897	339,018
1898	462,621
1899	611,382
1900	701,006
1901	131,184
1902 (to Oct. 20)	186,744

Olives.—The olive crop of 1901–02 was a phenomenal one. For many years there have been numerous complaints of the shyness of the olive as a bearer in most sections, but in all sections last season the olive endeavored to compensate for its shortcomings. It was the heaviest crop ever produced in the State, and the pack of both oil and pickles was exceptionally heavy. A great deal of damage has been done to the market for ripe pickled olives, through the efforts of unscrupulous parties to substitute dyed green olives. The pickling of ripe olives requires more care and attention than does the pickling of green fruit; but the superior flavor and food qualities of the former have rapidly brought them into favor. To meet the demand and at the same time avoid the extra care required in preparing the ripe fruit, some packers used dye-stuffs to color their inferior fruit and give it an attractive appearance. The fraud was detected, owing to the effect of the chemicals upon the persons who ate the fruit and who were sickened and injured by it. The parties perpetrating the fraud were arrested, severely punished, and the pratice nipped in the bud. Unfortunately, the notoriety given to the ripe pickled olive by it has had its effect, from which it will take some time to recover. The Los Angeles Times of April 6, 1902, gives the following account of this matter of dyeing olives:

> A stir was made yesterday when the attention of the Los Angeles Health Office was called to some very black pickled olives that had been purchased at the store of Adams & Hellinghausen, on Broadway. The paper bag in which the olives had been carried to the office was stained a vivid green wherever it had been touched by an olive. The tongue and lips of persons who attempted to eat of them, became swollen and inflamed, and remained in that condition for hours afterward.
>
> The olives were of an even, almost black color, on the outside, and when cut showed dark purple under the skin, and then bright green half way to the seed. They had been taken green from the tree and submitted to some sort of a dyeing process to give them the appearance of ripe olives.
>
> E. T. Morris, who lives at No. 232 South Hill street, bought some of these olives on Friday. He ate two of them himself, his little boy ate three, and Mrs. Morris ate one. The unpleasant effect on the mouth was at once apparent, and then the membrane became swollen and inflamed, and Mr. Morris and his family all became sick and greatly alarmed. Remedies were at once applied to Mrs. Morris and the boy, but the head of the family thought he would "grin and bear it," to see what the outcome would be. He suffered all night, as with cholera morbus, and none of them were fully recovered from the effects yesterday, when he decided to report to the authorities.
>
> Mr. Morris's experience was doubly aggravating to him, for the reason that he had been the special champion of California olives. Four years ago, while living here, he

sent back to his friends in New York a dozen bottles of ripe olives, because ripe olives were a novelty to them. They were delighted, and now on his return to this city, Mr. Morris wanted to be real nice to a couple of these same friends, so he went and purchased some of these same black olives and sent them by express to New York.

Imagine his chagrin, when yesterday, with his lips still swollen and his stomach still in a state of agitation from his own experience, he received a letter from one of his friends, worded as follows:

"Thank you very much for the olives, but the next time send the olives in their natural state, and we'll blue them ourselves."

Mr. Hellinghausen, in the presence of his partner, and speaking for the firm, said to a Times reporter:

"When we bought these olives from Hill & Sons they were sold to us for ripe olives, but after a customer or two had sent them back, I told Hill's agent that there was something wrong with them, and we wanted them to take them back."

In spite of this, however, they continued to sell them, for several weeks, and when Mr. Morris asked for olives on Friday he was in turn asked whether he would have light ones or dark ones, and, without trying them, he chose the latter.

A Times reporter called at the store, in company with Fruit Inspector Drummond, when the latter bought some of the olives in question, and an hour later he was informed that the barrel had been returned to the factory.

Mr. Cunningham, manager of the Hill establishment, said, when asked for an explanation:

"There were several packages of these olives on which we had been experimenting with coloring matter of a perfectly harmless nature. They were put out by accident, and when the discovery was made, steps were at once taken to get them back, and we were not aware that this package was still in the hands of Adams & Hellinghausen."

If there is any one thing that Southern California can not afford to do, it is to permit to go unexposed any tampering with her food products. The bleaching of dried fruits, the "dipping" of prunes, the slight coloring of certain products to make them appear more attractive in the package, may be looked upon as innocent tricks of the trade; but when it comes to changing the nature of the product by chemical treatment, which proves a menace to life, it is quite another thing.

The Health Office will make an analysis of the olives to discover, if possible, what was used in the coloring matter. It looks like aniline dye, and the effect on the membrane of the mouth is something not soon to be forgotten. Mr. Cunningham was asked if it was formalin, but he evaded the question and replied that it was a "perfectly harmless substance."

The lips of a Times reporter, who ate some of the poisoned olives, were badly blistered and remained so till an early hour this morning. Evidently the "perfectly harmless substance" has a stick in it.

The proprietors of Hill & Sons' factory say they were unaware that this experiment was being made, and that when they found out about it they severely reprimanded the experimenters.

Many small oil-makers complain of a lack of demand for their oils and find some difficulty in selling it. At the same time there is a large and unsupplied demand for oil in the United States, and the larger manufacturers have little trouble in securing a market for their output. In this, as in all branches of industry to-day, the small manufacturer is unable to push his wares into the market and is consequently at a disadvantage. The solution for this trouble will be in the combination of the small growers, the establishment of a central mill and factory, and the production of oil in sufficient quantity to warrant exploiting the market. That there is room for California oil is shown by the following figures of the importation of foreign oil:

Importation of Foreign Olive Oil Into the United States.

Fiscal Year.	Gallons.	Value.
1892-93	686,852	$891,424
1893-94	757,478	909,897
1894-95	775,046	952,405
1895-96	942,598	1,107,049
1896-97	928,567	1,134,077
1897-98	736,877	923,800
1898-99	930,042	1,090,254
1899-00	967,702	1,170,871
1900-01	983,059	1,266,293
1901-02	1,339,097	1,579,409

In his annual report to the State Board of Trade, General N. P. Chipman furnishes the following tables of the movements of California fruits. These tables are as nearly accurate as can be compiled, as the figures are obtained directly from the transportation companies. As the season of 1902 is not closed, figures for the present year, of course, are not available:

Shipments of Fruit Out of State in 1901.

Showing terminal points of shipment. Tons of 2,000 pounds.

Place of Shipment.	Green Decid'us	Citrus.	Dried.	Raisins.	Nuts.	Canned	All kinds.
Northern California.							
San Francisco	277.4	41.8	8,873.1	187.1	569.9	19,273.9	29,223.2
Oakland	2,029.2	.1	1,506.5	.2	24.5	6,332.6	9,893.1
San José	22,555.3	.1	41,944.6	8.0	476.6	6,889.3	71,873.9
Stockton	9,429.7	13,545.3	18,411.4	34,898.1	110.1	5,318.5	81,713.1
Sacramento	53,229.0	662.4	16,576.4	641.3	567.7	6,841.6	78,518.4
Marysville	2,207.3	4,225.8	8,708.0	79.7	121.9	3,987.9	19,330.6
Interior points not designated	573.0	2,317.1	3,635.0	5,679.0	--------	1,150.1	13,354.6
Total tons	90,300.9	20,792.6	99,655.0	41,493.4	1,870.7	49,793.9	303,906.5
Total carloads, ten tons ea.	9,030.1	2,079.3	9,965.5	4,149.3	187.1	4,979.4	30,390.7
Southern California.							
Los Angeles	175.3	183,294.3	4,098.8	562.1	5,227.1	4,864.4	198,222.0
Orange County	14.4	17,985.2	205.7	45.4	1,327.8	510.0	20,088.5
Riverside County	13.0	47,984.6	284.5	21.2	--------	--------	48,303.3
San Bernardino County	26.9	43,299.5	1,192.7	430.1	10.3	927.8	45,887.3
San Diego County	--------	10,423.5	67.8	538.1	--------	--------	11,029.4
Total tons	229.6	302,987.1	5,849.5	1,596.9	6,565.2	6,302.2	323,530.5
Total carloads, ten tons ea.	23.0	30,298.7	585.0	159.7	656.5	630.2	32,353.1
Total carloads by rail	9,053.1	32,378.0	10,550.5	4,309.0	843.6	5,609.6	62,743.8
Total carloads by sea	314.3	9.2	148.2	22.4	2.6	2,713.3	3,210.0
Total carloads from State by rail and sea	9,367.4	32,387.2	10,698.7	4,331.4	846.2	8,322.9	65,953.9

Shipments of Vegetables Out of State in 1901.

Tons of 2,000 pounds.

Place of Shipment.	Green Vegetables.	Canned Vegetables.	Place of Shipment.	Green Vegetables.	Canned Vegetables.
Northern California.			*Southern California.*		
San Francisco	20,442.8	555.8	Los Angeles	26,397.3	231.5
Oakland	784.1	3,230.2	Orange County	1,199.7	------
San José	982.1	1,432.2	Riverside County	7.9	------
Stockton	11,567.3	40.8	S. Bernardino Co.	132.7	------
Sacramento	9,794.8	1,972.5	San Diego County	15.0	------
Marysville	339.5	--------			
Other points not designated	4,591.8	--------			
Total tons	48,502.4	7,231.5	Total tons	27,752.6	231.5
Total carloads, ten tons each	4,850.2	723.1	Total carloads, ten tons each	2,775.3	23.1
Total carloads by rail				7,625.5	746.2
Total carloads by sea				783.2	17.9
Total carloads from State				8,408.7	764.1

Table of Gain—1900 and 1901 Compared.

Carloads of ten tons each.

Kinds.	1900.	1901.	Gain.
Green deciduous	9,117.7	9,367.4	249.7
Citrus fruits	22,654.6	32,387.2	9,732.6
Dried fruits	9,005.4	10,698.7	1,693.3
Raisins	3,604.6	4,331.4	726.8
Nuts	651.9	846.2	194.3
Canned fruits	7,555.6	8,322.9	767.3
Vegetables	5,140.7	9,172.8	4,032.1
Totals	66,797.8	83,731.9	17,396.1

GENERAL SUMMARY AND COMPARATIVE TABLES OF SHIPMENTS OUT OF STATE, BY RAIL AND BY SEA, OF FRUITS, WINE, BRANDY, AND VEGETABLES FOR TWELVE CONSECUTIVE YEARS. TONS OF 2,000 POUNDS.

Kinds.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.
Green deciduous	34,042.0	50,548.9	59,374.5	80,112.3	90,692.2	66,254.8	57,638.3	72,350.2	69,732.2	96,943.6	91,176.5	93,673.7
Citrus fruits	34,209.6	46,921.4	34,857.5	80,757.0	58,964.0	115,825.5	99,156.0	98,547.0	180,658.9	131,916.8	226,546.6	323,871.4
Dried fruits	32,297.5	32,919.0	29,762.2	45,386.2	51,828.2	61,386.4	48,522.8	75,159.7	76,662.7	86,925.3	90,052.8	106,987.1
Raisins	20,560.1	22,779.1	26,673.4	37,409.9	46,954.4	46,390.1	34,434.6	39,065.8	47,796.3	36,008.7	36,047.0	43,314.0
Nuts	787.1	1,358.9	2,061.9	1,796.5	3,953.5	3,234.7	4,972.6	5,808.6	5,815.8	6,608.4	6,518.4	8,462.4
Canned fruits	40,060.9	32,395.0	55,273.7	31,626.3	60,352.6	41,395.5	45,546.9	73,464.7	52,219.7	75,240.0	75,556.9	83,229.1
Carloads fruit, by rail and by sea	16,195.7	18,692.2	20,800.3	27,708.8	31,274.4	33,547.2	29,026.7	36,439.6	43,288.6	43,364.3	52,901.5	65,953.8
Carloads vegetables, by rail	*	*	*	6,978.4	4,276.6	3,613.6	1,130.6	4,243.8	3,045.6	2,613.6	4,367.8	8,371.7
Carloads vegetables, by sea	*	*	*	*	410.0	40.0	487.7	490.8	801.4	790.7	772.9	801.1
Carloads wine and brandy, by rail and sea	*	4,765.1	4,832.5	6,620.9	7,663.5	8,056.8	7,609.0	6,897.8	9,014.0	8,713.9	9,067.3	8,605.3
Carloads fruit, vegetables, wine, and brandy, by rail and sea	16,195.7	23,347.3	25,632.8	40,928.5	43,624.7	45,257.4	38,254.0	48,072.0	56,149.6	55,482.5	66,797.8	83,731.9

* None reported.

IMPORTATIONS OF FRUITS AND NUTS.

The value of fruit importations into the United States for the fiscal year 1901–02 was $17,436,306, and the total of fruit and nuts $21,480,525. A very large part of this was for tropical fruits which can not be grown profitably in California, but by far the greater part was for such fruits as are grown here. This is sufficient to show that there is still a market not reached by us for fruit and fruit products. Our exportation of fruit and nuts for the same year amounted to $8,719,344, leaving a balance against us of $2,761,178.

Quantity and Value of Fruits and Nuts Imported into United States during Fiscal Years 1900, 1901, and 1902, ending June 30th.

	1900.		1901.		1902.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Oranges	68,618,938	$1,087,041	50,332,914	$716,457	52,742,476	$784,640
Lemons	160,198,056	3,666,881	148,514,614	3,516,856	164,182,952	3,327,781
Figs	8,812,487	513,895	9,933,871	458,513	11,087,131	487,733
Currants	36,251,779	916,908	16,049,198	916,994	36,238,976	1,238,756
Dates	19,902,512	410,349	18,434,917	372,400	20,013,681	344,833
Raisins	10,309,498	531,124	3,860,836	297,631	6,563,302	392,551
Plums & Prunes	443,457	47,700	745,974	62,880	522,478	44,077
Almonds	6,317,633	949,083	5,140,232	946,138	9,868,982	1,240,886

The total value of nuts and fruits imported into the United States for the fiscal years ending June 30, 1900 and 1901, was $19,263,592 and $19,586,703, respectively. Of the fruits imported for 1901, Italy contributed larger imports than any other country, consignments worth $4,170,000 being received. Next to Italy the British West Indies were the most important source of supply, furnishing shipments to the value of $3,431,000. Other countries of leading importance in the trade were Spain, France, Costa Rica, and Honduras. Spain contributed $1,870,000 worth and France $1,521,000 worth. The imports from Costa Rica were valued at $1,297,000 and the imports from Honduras at $1,070,000. The value of fruits and nuts imported from the Philippine Islands during 1901 amounted to $4,858. The importations from Porto Rico during 1901 were: lemons, 707,251 pounds, valued at $8,824, and oranges, 4,790,369 pounds, valued at $60,876. The fruit shipments from Hawaii were valued at $75,000.

In order that a comparison may be made, a table is given below of the imports for 1892 and 1893. Although California has furnished an immense and constantly increasing quantity of the fruits and nuts enumerated, yet there is not as much of a decline in the imports of 1901 as might have been expected, proving that consumption has nearly kept pace with production and importation, and that there is yet a large and remunerative field in domestic markets to be supplied by home efforts:

Quantity and Value of Fruits and Nuts Imported Into United States during Fiscal Years 1892 and 1893, ending June 30th.

	1892.		1893.	
	Pounds.	Value.	Pounds.	Value.
Oranges		$1,210,338		$1,695,469
Lemons		4,548,263		4,994,328
Figs	8,338,759	511,142	10,503,928	548,995
Currants	36,665,828	1,209,119	33,166,546	1,185,537
Dates	17,084,557	551,629	16,211,906	493,910
Raisins	20,687,640	964,309	27,543,563	1,266,342
Plums and Prunes	10,869,797	437,271	26,414,112	1,162,318
Almonds	7,629,392	1,028,671	6,679,147	938,054
Other Nuts*		821,200		951,941

* Exclusive of cocoanuts.

The value of fruits exported in 1901 was as follows: Apples (dried), 28,877,085 pounds, valued at $1,648,410; apples (green or ripe), 779,980 barrels, valued at $1,753,988; oranges, $332,434; prunes, 14,375,073 pounds, valued at $909,545; raisins, 3,424,267 pounds, valued at $192,022; other green, ripe, or dried fruit, $2,323,304; canned fruits, $2,355,113; other preserved fruits, $65,545. Total, $9,263,339. The value of nuts exported (description not given), $160,544. Grand total of fruits and nuts, $9,423,883.

EXPORTS OF FRUIT AND NUTS FROM THE UNITED STATES DURING THE FIVE YEARS ENDED JUNE 30, 1902.

Articles Exported.	1898.		1899.		1900.		1901.		1902.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Fruits—										
Apples, dried (lbs.)	31,031,254	$1,897,725	19,305,739	$1,245,733	34,964,010	$2,247,851	28,309,023	$1,510,581	15,664,468	$1,190,593
Apples, green or ripe (bbls.)	605,390	1,684,717	380,222	1,210,459	526,636	1,444,655	883,673	2,058,964	459,719	1,628,886
Apricots, dried									1,928,367	178,143
Oranges		339,396		282,313		271,468		436,560		420,835
Prunes (lbs.)	15,940,791	1,021,888	5,615,565	380,847	25,922,371	1,646,332	10,021,564	589,113	23,358,849	1,404,422
Raisins (lbs.)	3,109,639	167,062	4,659,807	242,620	2,415,456	139,689	3,512,164	218,715	2,323,274	149,216
Other green, ripe, dried		2,033,845		1,997,649		2,545,451		2,716,269		2,153,050
Preserved—										
Canned		1,624,741		2,330,715		3,127,278		3,006,109		1,195,635
Other		82,504		66,899		63,448		71,597		94,323
Total fruits		$8,851,878		$7,757,235		$11,486,172		$10,607,908		$8,415,103
Nuts		161,432		140,250		156,490		218,743		304,241
Total fruits and nuts		$9,013,310		$7,897,485		$11,642,662		$10,826,651		$8,719,344

Included in the dried fruit shipments for 1901–02 were 1,928,367 pounds of apricots, valued at $178,143, which had not been segregated prior to this year.

FRUIT ACREAGE IN CALIFORNIA.

The number of trees in California, according to the last returns of the County Assessors, compiled by the State Board of Equalization, was 30,985,404, of which 23,389,919 were in bearing and 7,595,485 were non-bearing. Allowing 100 trees to the acre, this would give us 309,854 acres of land in fruit in the State. The assessor's figures are, as a rule, very unreliable, as many assessors fail to make proper returns, others make random estimates, while only a few make conscientious returns. Difficulties, also, are met with in making these returns. Many farmers are suspicious that the information is required for assessment purposes, and are unwilling to supply it, while others keep no systematic account of the number of their trees. It is safe, therefore, to add at least 10 per cent to the figures here given, which are the only ones available, and furnish an approximate idea of the extent of the fruit interests of the State.

Kind of Fruit.	Number of Trees in Bearing.	Number of Trees Non-Bearing.
Apple	1,586,241	534,354
Almond	1,160,750	278,622
Apricot	2,305,277	386,002
Cherry	409,325	116,409
Fig	149,360	46,338
Grape (acres)*	187,200	23,610
Lemons	805,263	504,622
Lime	1,220	....
Nectarine	1,147	105
Orange	3,137,308	1,843,200
Olive	590,543	571,480
Peach	4,681,455	1,401,881
Pear	1,343,543	333,210
Plum	265	330
Pomelo	9,600	12,425
French Prune	6,249,955	1,132,287
Prune	625,205	246,287
Quince	1,425	105
Walnut	326,547	185,503
Miscellaneous	5,490	2,325
Total	23,389,919	7,595,485
Total, all kinds		30,985,404

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*Not included in totals.

NUMBER OF FRUIT TREES IN CALIFORNIA, BY COUNTIES.

As per Assessors' Returns, March, 1901.

COUNTIES.	APPLE.		APRICOT.		CHERRY.	
	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.
Alameda	54,000	1,500	102,000	8,000	78,300	20,200
Alpine	1,021	285			50	
Amador	4,540	1,075	1,554		504	
Butte	8,175		14,450		9,600	
Calaveras	6,000	4,000	2,000	1,000	500	200
Colusa	3,500	1,020	27,475	43,000	1,000	300
Contra Costa	10,300	1,250	47,450	4,500	10,800	910
Del Norte	7,950	550			300	42
El Dorado	29,160	5,650	2,000	650	4,200	1,120
Fresno	18,640	6,420	53,500	35,000	1,146	354
Glenn		9,000		15,000		1,000
Humboldt						
Inyo	18,570	200	610	40	660	30
Kern	6,000	4,000	20,000	500	1,000	650
Kings	2,200		19,780	2,000		
Lake	18,965		1,610		755	
Lassen	39,650		224		652	
Los Angeles	25,665	18,230	78,655	28,250	50	1,180
Madera	825		8,785		10	
Marin	18,650	1,150	6,500	900	400	95
Mariposa	35,000		700		500	
Mendocino	83,128	16,195	325	187	328	207
Merced	1,800	670	6,510	4,017	920	450
Modoc	13,196		433		725	
Mono						
Monterey	300,210		7,200		210	
Napa	48,250	16,480	1,645	12,530	4,160	12,100
Nevada	40,400	300	4,100	300	2,300	
Orange	8,514	6,220	80,045	53,251		
Placer	24,300	7,425	11,240	4,350	12,785	6,740
Plumas	3,750	1,500			100	
Riverside	2,264	1,409	64,848	10,147	464	627
Sacramento	5,850	1,350	26,000	38,000	5,400	8,950
San Benito	9,500		15,000	3,000	2,500	560
San Bernardino	10,000	3,500	60,000	3,000	8,000	3,000
San Diego						
San Francisco						
San Joaquin	1,410	975	81,483	17,600	4,006	3,720
San Luis Obispo	64,100	12,500	49,200	8,100	7,100	3,500
San Mateo	17,000	6,800	10,500	520	1,350	
Santa Barbara	15,880	9,740	11,780	3,610		
Santa Clara	21,020	975	531,000	14,075	128,000	25,500
Santa Cruz	279,540	276,545	35,398	29,401	17,768	4,487
Shasta						
Sierra	7,200		20		200	
Siskiyou						
Solano	2,020		308,610		37,980	
Sonoma	170,160	71,320	14,700	2,660	29,960	13,240
Stanislaus	58		151			
Sutter	4,830		12,905		3,595	
Tehama	17,490	1,360	52,385	4,720	3,700	1,490
Trinity	4,500	3,000	50		210	240
Tulare	14,705	12,340	50,050	5,100	525	184
Tuolumne	3,650	5,020	2,250	560	3,005	365
Ventura	30,872		341,679		700	
Yolo	350		75,000		8,200	
Yuba	7,400	700	17,300	4,300	9,400	2,200
Totals	1,522,158	510,654	2,261,100	358,268	404,018	113,641

NUMBER OF FRUIT TREES IN CALIFORNIA, BY COUNTIES—Continued.

As per Assessors' Returns, March, 1901.

COUNTIES.	PEACH.		PEAR.	
	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.
Alameda	79,000	6,000	62,000	8,200
Alpine	--------	--------	110	40
Amador	13,185	375	4,869	--------
Butte	125,000	--------	20,425	--------
Calaveras	4,000	1,000	500	100
Colusa	25,000	15,000	20,022	15,200
Contra Costa	30,165	3,350	62,100	19,800
Del Norte	50	--------	650	250
El Dorado	125,900	21,600	60,000	35,100
Fresno	375,000	216,700	85,640	39,400
Glenn	--------	20,000	--------	15,000
Humboldt	--------	--------	--------	--------
Inyo	6,100	100	2,350	200
Kern	35,000	--------	15,000	--------
Kings	201,980	8,050	42,500	1,200
Lake	14,870	--------	19,830	--------
Lassen	721	--------	1,003	--------
Los Angeles	91,825	33,940	18,130	865
Madera	24,790	--------	2,120	--------
Marin	4,650	420	--------	--------
Mariposa	6,000	--------	3,000	--------
Mendocino	19,275	3,009	8,240	201
Merced	50,500	20,100	7,000	1,500
Modoc	409	--------	763	--------
Mono	--------	--------	--------	--------
Monterey	960	--------	1,400	--------
Napa	91,200	23,860	47,100	16,460
Nevada	9,400	1,200	26,000	500
Orange	16,843	27,141	3,285	1,845
Placer	633,400	510,690	98,400	26,495
Plumas	500	200	700	500
Riverside	26,350	5,953	14,264	2,821
Sacramento	123,000	42,000	65,000	60,000
San Benito	14,000	4,000	11,750	3,600
San Bernardino	75,000	4,000	5,000	1,000
San Diego	--------	--------	--------	--------
San Francisco	--------	--------	--------	--------
San Joaquin	75,621	18,211	15,826	3,940
San Luis Obispo	58,500	23,500	33,100	11,200
San Mateo	1,200	--------	4,000	--------
Santa Barbara	5,745	2,680	1,615	730
Santa Clara	487,030	55,510	120,150	18,820
Santa Cruz	20,929	1,566	21,006	3,513
Shasta	--------	--------	--------	--------
Sierra	400	--------	200	--------
Siskiyou	--------	--------	--------	--------
Solano	308,720	--------	203,250	--------
Sonoma	19,755	13,860	45,960	10,320
Stanislaus	163	74	47	--
Sutter	134,910	12,525	21,907	38,972
Tehama	566,250	131,130	43,500	14,900
Trinity	900	575	350	195
Tulare	340,364	47,628	21,724	2,345
Tuolumne	9,070	2,940	2,215	300
Ventura	43,970	--------	5,800	--------
Yolo	183,000	--------	48,000	--------
Yuba	71,000	29,260	17,225	2,700
Totals	4,552,400	1,308,147	1,315,026	358,212

NUMBER OF FRUIT TREES IN CALIFORNIA, BY COUNTIES—Continued.

As per Assessors' Returns, March, 1901.

COUNTIES.	PRUNE (French).		PRUNE (Other).	
	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.
Alameda	140,000	28,000	18,000	2,500
Alpine			200	
Amador	11,157	2,080		
Butte	75,200		8,115	
Calaveras	200	200	800	100
Colusa	75,000	50,000	1,300	1,800
Contra Costa	30,450	2,310	7,000	950
Del Norte			1,300	
El Dorado	26,000	1,110	8,430	2,110
Fresno	22,300	3,250	7,685	5,870
Glenn		40,000		5,000
Humboldt				
Inyo	2,000	115	2,400	225
Kern	75,000		1,000	
Kings	91,820	2,500	10,365	1,540
Lake	58,320		2,750	
Lassen	940		736	
Los Angeles	49,500	18,880	11,665	12,060
Madera	3,244			
Marin			1,800	1,085
Mariposa	1,500		300	
Mendocino	47,222	30,875	2,214	1,007
Merced	17,200	5,000	2,150	680
Modoc	224		929	
Mono				
Monterey	17,200			
Napa	98,480	78,975	28,500	4,800
Nevada	1,800			
Orange	24,050	12,385		
Placer	12,490	9,000	67,945	47,480
Plumas				
Riverside	41,633	9,329		
Sacramento	25,000	53,000	30,000	79,000
San Benito	74,810	5,000	6,300	
San Bernardino	20,000	10,000		
San Diego				
San Francisco				
San Joaquin	45,209	18,700	13,740	12,600
San Luis Obispo	152,230	37,200	39,200	14,100
San Mateo	30,000			
Santa Barbara	1,445	420	1,970	410
Santa Clara	3,550,120	376,200	47,015	39,100
Santa Cruz	153,871	29,220	18,241	7,508
Shasta				
Sierra				
Siskiyou				
Solano	255,990		98,400	
Sonoma	360,970	155,270	38,240	6,870
Stanislaus	162	23		
Sutter	2,500		2,550	
Tehama	71,270	17,550	15,400	3,600
Trinity	550	505	250	190
Tulare	338,875	46,783	51,776	2,556
Tuolumne			275	170
Ventura	85,380			
Yolo	25,000		70,000	
Yuba	17,900	3,890	3,175	375
Totals	6,134,212	1,047,770	622,116	253,686

NUMBER OF FRUIT TREES IN CALIFORNIA, BY COUNTIES—Continued.

As per Assessors' Returns, March, 1901.

COUNTIES.	FIG.		OLIVE.		ORANGE.	
	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.
Alameda	100	----------	4,000	1,300	1,900	300
Amador	490	----------	17	----------	240	----------
Butte	9,320	----------	71,000	32,000	307,800	20,090
Calaveras	400	200	6,000	1,000	300	400
Colusa	3,000	2,000	700	500	800	950
Contra Costa	2,790	645	18,100	6,500	1,050	415
El Dorado	1,410	350	1,500	600	1,125	740
Fresno	32,300	4,600	15,420	35,800	20,740	17,560
Glenn	----------	9,000	----------	1,000	----------	8,000
Inyo	50	----------	----------	----------	----------	----------
Kern	1,000	----------	4,700	----------	3,500	----------
Lake	1,660	----------	2,365	----------	50	----------
Lassen	----------	----------	----------	----------	----------	----------
Los Angeles	2,785	1,605	13,310	173,270	579,585	273,080
Madera	6,394	----------	1,160	----------	186	----------
Marin	190	60	----------	----------	300	100
Mariposa	1,000	----------	9,000	----------	600	----------
Mendocino	65	18	15	250	----------	----------
Merced	5,718	1,000	24,019	2,000	3,450	450
Modoc	----------	----------	----------	----------	----------	----------
Monterey	----------	----------	----------	----------	----------	----------
Napa	1,460	430	32,400	22,340	2,990	140
Nevada	1,000	50	400	50	600	50
Orange	2,700	----------	32,875	11,060	240,328	118,720
Placer	4,020	2,150	28,740	18,200	17,300	14,675
Riverside	2,126	57	23,814	37,861	772,899	380,642
Sacramento	1,300	2,600	11,050	6,000	20,000	21,000
San Benito	200	----------	300	----------	100	----------
San Bernardino	3,000	1,500	20,000	1,500	750,000	600,000
San Joaquin	6,010	1,240	19,790	5,092	1,228	1,540
San Luis Obispo	2,140	1,000	2,580	800	2,850	1,410
San Mateo	100	----------	7,000	500	108	----------
Santa Barbara	----------	----------	19,940	14,260	1,510	740
Santa Clara	1,650	480	8,890	6,800	998	560
Santa Cruz	307	131	1,742	2,582	124	92
Solano	5,300	----------	3,360	----------	1,260	----------
Sonoma	1,910	1,010	28,960	14,960	4,590	1,040
Stanislaus	44	----------	108	23	62	3
Sutter	2,541	----------	2,100	----------	497	----------
Tehama	9,840	1,075	10,490	87,472	1,690	4,562
Trinity	7	----------	----------	----------	----------	----------
Tulare	5,907	1,542	4,186	3,745	205,595	295,956
Tuolumne	930	235	20	25	345	120
Ventura	2,383	----------	85,307	----------	66,485	----------
Yolo	3,900	----------	16,500	----------	12,000	----------
Yuba	5,003	1,650	7,600	1,675	32,600	29,360
Totals	132,450	34,628	539,458	489,165	3,057,785	1,792,695

NOTE.—No trees reported by assessor's returns for the following counties: Alpine, Del Norte, Humboldt, Kings, Mono, Plumas, San Diego, San Francisco, Shasta, Sierra, and Siskiyou.

NUMBER OF FRUIT TREES IN CALIFORNIA, BY COUNTIES—Continued.

As per Assessors' Returns, March, 1901.

COUNTIES.	LEMON.		ALMOND.		WALNUT.	
	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.
Alameda	900	300	65,000	25,000	1,400	900
Amador	5	....	2,357	....	77	....
Butte	1,220	....	25,375	....	965	....
Calaveras	50	50	1,000	500	400	300
Colusa	100	150	3,000	11,200	....	....
Contra Costa	330	150	130,300	50,000	2,450	1,975
El Dorado	210	....	2,200	870	480	140
Fresno	3,900	9,400	3,500	2,300	2,750	680
Glenn	....	2,500	....	5,000	....	....
Inyo	....	....	40	....	400	....
Kern	300	....	1,200	....	50	....
Lake	....	....	5,825	....	800	....
Lassen	....	....	36	....	208	....
Los Angeles	172,880	25,750	36,635	51,715	93,030	48,120
Madera	41	....	836	....	35	....
Marin	25	15	125	60	50	45
Mariposa	3,000	....	600	....	400	....
Mendocino	890	400	765	286	125	73
Merced	1,300	200	7,250	4,000	610	155
Modoc	....	....	....	....	51	....
Monterey	....	....	690	....	....	....
Napa	280	120	38,460	15,360	8,980	1,860
Nevada	300	50	800	75	1,300	300
Orange	24,780	52,548	....	....	94,610	73,650
Placer	500	490	3,200	2,450	1,240	960
Riverside	74,115	11,616	12,932	744	1,323	1,142
Sacramento	1,450	800	31,000	32,000	2,000	1,500
San Benito	....	....	7,000	....	400	1,500
San Bernardino	120,000	40,000	2,000	1,500	3,000	1,000
San Joaquin	446	275	126,757	40,312	720	570
San Luis Obispo	11,600	6,500	4,100	1,000	19,850	8,200
San Mateo	110	....	560	....	600	....
Santa Barbara	73,440	75,860	1,840	....	14,295	13,820
Santa Clara	379	620	15,210	4,065	8,905	2,560
Santa Cruz	94	41	407	61	1,566	4,430
Solano	280	....	97,390	....	600	....
Sonoma	510	430	2,260	1,390	2,240	2,070
Stanislaus	7	5	18	25	1	2
Sutter	68	....	33,730	1,744	1,045	....
Tehama	210	172	54,240	6,830	3,160	2,245
Trinity	....	....	5	....	75	25
Tulare	40,753	23,840	3,500	....	600	....
Tuolumne	110	100	305	45	845	850
Ventura	95,601	....	12,908	....	47,507	....
Yolo	1,400	....	412,000	....	....	....
Yuba	3,500	1,890	6,540	540	1,950	295
Totals	635,084	254,272	1,153,896	259,072	321,093	169,367

NOTE.—No trees reported by assessor's returns for the following counties: Alpine, Del Norte, Humboldt, Kings, Mono, Plumas, San Diego, San Francisco, Shasta, Sierra, and Siskiyou.

ACREAGE OF GRAPEVINES IN CALIFORNIA, BY COUNTIES.

As per Assessor's Returns, March, 1901.

COUNTIES.	TABLE.		RAISIN.		WINE.	
	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.	Bearing.	Non-Bearing.
Alameda	100				6,900	
Alpine	245					
Calaveras	50	50	25	10	1,200	500
Colusa	14	8	500	6	20	
Contra Costa	675	180	60	10	1,850	750
El Dorado	260	90	100		1,000	
Fresno	795	235	41,630	3,400	25,345	4,350
Inyo	20		47		50	
Kern	100		1,000			
Kings			6,000	350		
Lake	500				200	
Los Angeles	151		14		3,250	
Madera	308		440		710	
Marin					425	10
Mariposa	100		100		400	
Mendocino	825	700	35	10	460	880
Merced	520	150	950	350	625	248
Monterey			17			
Napa					3,000	
Nevada	200	20			300	
Orange			850			
Placer	840		175		290	
Riverside	42		262		18	
Sacramento	5,000		800		9,000	
San Benito	16				171	
San Bernardino			7,000	2,000	2,500	3,000
San Joaquin	960	1,550	280	390	870	1,217
San Luis Obispo	1,650	190			800	200
San Mateo					235	
Santa Clara	537				7,920	
Santa Cruz	559				1,069	
Shasta	103	87	5	5	200	
Solano	318				820	
Sonoma	270	90			12,080	2,370
Stanislaus	28		183		106	
Sutter	21	15	343	209	19	
Tehama	325		309		2,860	
Trinity	10					
Tulare			3,140	100		
Tuolumne	305	230			1,520	210
Ventura	55		146		95	
Yolo	1,700		8,000		7,200	
Yuba	45		110		215	
Totals	17,647	3,595	72,521	6,840	93,723	13,735

NOTE.—No vines reported by assessors' returns for the following counties: Amador, Butte, Del Norte, Glenn, Humboldt, Lassen, Modoc, Mono, San Diego, Plumas, San Francisco, Santa Barbara Sierra, and Siskiyou.

FRUIT AND VEGETABLE CANNERIES IN CALIFORNIA.

Cannery.	Location.	Agent or Drier.
J. C. Ainsley Packing Co.	Campbell	J. C. Ainsley Packing Co.
Bendel-Nelson Co.	Gridley	Griffith-Durney Co.
California Canneries Co.	San Francisco	
California Fruit Preserving Co.	Biggs	California Fruit Canners' Ass'n.
California Fruit Preserving Co.	Oakland	California Fruit Canners' Ass'n.
Cutting Fruit Packing Co.	Colton	California Fruit Canners' Ass'n.
Hunt Bros. Fruit Packing Co.	Santa Rosa	California Fruit Canners' Ass'n.
Chico Canning Co.	Chico	California Fruit Canners' Ass'n.
Lincoln Fruit Packing Co.	Lincoln	California Fruit Canners' Ass'n.
Whittier Cannery	Whittier	California Fruit Canners' Ass'n.
Courtland Packing Co.	Courtland	California Fruit Canners' Ass'n.
Cutting Fruit Packing Co.	Santa Rosa	California Fruit Canners' Ass'n.
Cutting Fruit Packing Co.	San Francisco	California Fruit Canners' Ass'n.
Rose City Canning Co.	Santa Rosa	California Fruit Canners' Ass'n.
Sacramento Packing Co.	Ventura	California Fruit Canners' Ass'n.
Sacramento Packing Co.	Sacramento	California Fruit Canners' Ass'n.
Sacramento Packing Co.	Visalia	California Fruit Canners' Ass'n.
San José Fruit Packing Co.	San José	California Fruit Canners' Ass'n.
Southern California Packing Co.	Los Angeles	California Fruit Canners' Ass'n.
Tenny, A. F., Co.	Fresno	California Fruit Canners' Ass'n.
Visalia Preserving Co.	Visalia	California Fruit Canners' Ass'n.
California Fruit Canners' Ass'n	Stockton	California Fruit Canners' Ass'n.
Cutting Fruit Packing Co.	Santa Ana	California Fruit Canners' Ass'n.
Marysville Packing Co.	Marysville	California Fruit Canners' Ass'n.
Oakland Preserving Co.	Oakland	California Fruit Canners' Ass'n.
Oakland Preserving Co.	Milpitas	California Fruit Canners' Ass'n.
King-Morse Canning Co.	San Francisco	California Fruit Canners' Ass'n.
King-Morse Canning Co.	San Leandro	California Fruit Canners' Ass'n.
Healdsburg Canning Co.	Healdsburg	California Fruit Canners' Ass'n.
Hanford Canning Co.	Hanford	California Fruit Canners' Ass'n.
Fontana & Co.	San Francisco	California Fruit Canners' Ass'n.
Sutter Canning and Packing Co.	Yuba City	California Fruit Canners' Ass'n.
Carquinez Packing Co.	Benicia	G. W. Hume & Co.
Flickinger, J. H., & Co.	San José	
Foster Bros. Home Packing Co.	Tremont	E. Foster.
Golden Gate Packing Co.	San José	Golden Gate Packing Co.
Goetjen, N.	San Francisco	N. Goetjen.
Hunt Bros. Co.	Haywards	
Hickmott Asparagus Canning Co.	Bouldin Island	Hickmott Asparagus Canning Co.
Los Gatos Canneries	Los Gatos	Hooke-Field Co.
Orange Preserving Co.	Anaheim	
Pasadena Packing Co.	Pasadena	
Pacific Fruit Packing Co.	San Francisco	
Redlands Preserving Co.	Redlands	Redlands Preserving Co.
Stetson, F. F., & Co.	Los Angeles	F. F. Stetson & Co.
Taylor, J. E., & Co.	Santa Ana	J. E. Taylor & Co.
Waters, G. H., & Co.	Pomona	G. H. Waters & Co.
Walden & Co.	Geyserville	
F. B. Hood Canning Co.	Emeryville	The Field Mercantile Co.
Central California Canning Co.	Sacramento	The Field Mercantile Co.
Pyle & Son	San José	C. W. Pike & Co.
East Side Canning Co.	Los Angeles	J. K. Armsby Co.
Pomona Canning Co.	Pomona	J. K. Armsby Co.
Corville Packing Co.	San Francisco	J. K. Armsby Co.
Sebastopol Packing Co.	Sebastopol	The Field Mercantile Co.
Overland Packing Co.	San Francisco	C. W. Pike & Co.
A. Mendenhall Cannery Co.	Clear Lake	Mansfield-Lovell Co.
Auburn Cannery	Auburn	
Chamberlain Canning Co.	Kern City	
Code Portwood Canning Co.	San Francisco	
California Canned Goods Co.	Napa	California Canned Goods Co.
Cerritos Valley Canning Co.	Hynes	Cerritos Valley Canning Co.
Griffin & Skelley Co.	Fresno	Griffin & Skelley Co.
Grand Island Asparagus Packing Co.	Grand Island	N. Goetjen.
Los Nietos Cannery	Los Nietos	Los Nietos Cannery.
Moneta Canning Co.	Moneta	Moneta Canning Co.
San José Fruit Preserving Co.	Mountain View	San José Fruit Preserving Co.
American Fruit Packing Co.	San Francisco	C. W. Pike & Co.

FRUIT AND VEGETABLE CANNERIES IN CALIFORNIA—Continued.

Cannery.	Location.	Agent or Drier.
Costa, L. D.	San José	L. D. Costa.
Southland Fruit Canning Co.	Long Beach	
Maywood Canning Co.	Corning	
California Fruit Co.	Ontario	
Napa Valley Packing Co.	Napa	
Jersey Island Canning Co.	Jersey Island	
George D. Kellog Packing Co.	Newcastle	
Rose Canning Co.	Petaluma	
Gibbs-Wilson Canning Co.	San Francisco	

REPORTS

ON THE

Pear-Blight in California.

Olive-Knot in California.

Root-Knot of Plum, Prune, and Peach Trees.

Asparagus Rust.

THE PEAR-BLIGHT IN CALIFORNIA.

BY JOHN ISAAC, SPECIAL AGENT.

To the Honorable the State Board of Horticulture:

GENTLEMEN: Acting under your instructions to investigate the pear-blight in California, its spread and destructiveness, with a view to taking some measures to prevent its ravages, and, if possible, to reducing its area of damage, I have visited most of the pear-growing sections of the State, personally inspected very many of the principal orchards, besides having carried on an extensive correspondence with all sections where the disease was likely to be found, and herewith beg to submit my report.

Area of Infestation.—Kings County appears to be the center of the disease, and there hardly a pear tree has escaped infection; in many cases whole orchards have been destroyed and in others fully 50 per cent of the trees were killed and the remainder affected to a greater or less extent. In company with Horticultural Commissioner James A. Hill, I visited a large number of pear orchards there, and the disease is so generally distributed that I should estimate that at least 90 per cent of the trees are affected more or less.

In Tulare County, while the disease is very general and has done very extensive damage, the extent of its destructiveness has not been so great as in Kings County. The greater part of the pear orchards are involved, but in most cases the disease was confined to the new growth and the smaller branches. Some trees had been killed to the ground, but the percentage of these was not so great as in the adjoining county.

Kern County is afflicted to about the same extent as Tulare County, and radiating from these counties in all directions the disease seems to decrease in virulence, until in the more northern counties it is unknown.

In Fresno County the pear orchards are very seriously affected, most of the new growth being killed, and the orchards appear as though they had been swept by fire.

In all of the Southern California counties pear-blight is well established, but in none of them is the pear very extensively cultivated, and in consequence the damage done by blight is not serious.

North of Fresno the disease has not obtained any serious foothold.

A few cases have been reported, but, outside of the districts mentioned, it is not general nor is any great danger apprehended from it.

San Diego County: Pear-blight was first reported here in 1899. Few trees have been attacked, but these have suffered severely. All varieties of pears except Winter Nelis were attacked, as were also many varieties of apples. Apples especially affected were King of Tompkins County, Bellefleur, Red June, and Newtown Pippin. The White Winter Pearmain, Smith's Cider, and Rhode Island Greening were found most resistant. The only remedies found at all effective were cutting back and destroying the infected wood. There has been little seen of the disease during the past two years and it appears to be dying out.

Riverside County: Pear-blight first came into notice here about 1896. Its origin is unknown. It has spread more rapidly during the past two years than ever before, until at present there are about 60 per cent of the pear and apple trees involved. The Bartlett is the most susceptible, and the Seckel and Winter Nelis most resistant to its attacks. Cutting out the affected part is the only remedy, and this is successful in about 30 per cent of the cases.

San Bernardino County: Pear-blight is very general here, from 50 to 60 per cent of the trees being affected. It has been known since 1895 or earlier, but has not become serious until within the last three years. There are very few pears grown in this county, so the blight is not regarded as a serious fruit disease. Loquats have been attacked by it and many trees have died. It does not appear to be spreading to any extent.

Los Angeles County: Pear-blight has existed here for several years, but has only recently been regarded as alarming. It has now become general, involving at least 60 per cent of the pear trees and many apple and loquat trees. It is no more virulent this year than last, and it is believed to have reached its limit of destructiveness. The only remedy is cutting out and destroying the diseased trees.

Orange County: Pear-blight is very general here, involving alike pear, apple, and loquat. It was first reported as serious about 1899, since which time it has spread rapidly, until now about 60 per cent of the pear trees are infected and a very large number of apples and loquats are suffering. The Bartlett is the principal pear afflicted, and of these very few escape. Many remedies have been applied, but the knife and saw are the only ones to be recommended.

Ventura County: Pear-blight is found here, but it is not very serious. Pears are not very extensively grown and little attention has been paid to the disease.

Santa Barbara County: Professor T. N. Snow, secretary of the Horticultural Commission, reports: "Up to the present date, no case has been reported to this Board, nor have we observed it in our inspections so far. We shall take special pains in future to see if it is to be found in our county."

Madera County: Pear-blight is found in this county to a small extent, but is not very bad, not over one per cent of the trees being affected. It has been known for several years, but it is not spreading very fast, if at all. No efforts have been made to stay its progress, nor has it been regarded as serious.

Merced County: Very few trees have been noticed as affected with the blight, which has not done any damage in this section.

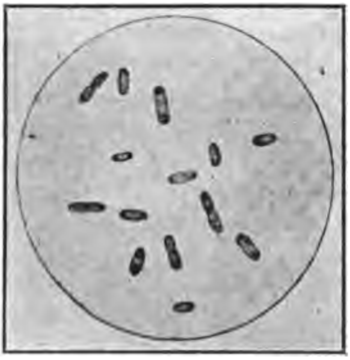
In Stanislaus County, and counties north from there, pear-blight is not reported, and if it is found, exists in isolated cases and is not spreading or regarded as a threatening danger.

Symptoms of the Disease.—There is probably no disease attacking fruit trees which is so marked or deadly in its effects as the one under consideration. A tree is in full vigor, puts forth a full crop of blossoms, the young leaves shoot out, and the wood appears bright and healthy, and there is every promise of a bounteous crop. In a few days the blossoms droop, wither, and dry up, the leaves turn brown and crisp, the young wood deadens, and in many cases the disease follows down until branches and trunk are attacked and the whole tree is involved and dies to the ground. While the disease is the worst on the pear, attacking the finer pears, the Bartlett being of all varieties the one most susceptible, all the pomaceous fruits are subject to the disease, and it is found on the apple, hawthorn, medlar, quince, and loquat.

The evidences of pear-blight are unmistakable; the scorching of the blossoms, the blackening of the leaves, the gradual dying back of the younger twigs, the progress of the disease from the top downward, an inch or more each day, and finally the death of the larger limbs, are all symptoms that even the most inexperienced can observe. Usually it is the most thrifty trees that are most susceptible to attack and injury. Trees that are carefully cultivated, grown on rich soil, and making a vigorous growth, furnish ideal conditions for the progress of the disease, while those neglected or grown in uncongenial conditions best resist its attacks.

Manner of Attack.—The point of entry of the disease in probably 99 per cent of the cases is through the blossoms. In some cases the new and tender growth may offer a point of entrance, and in rarer cases it may communicate to the older wood, but the blossom is the one general point of entry. The germs of the disease are carried to this point, follow the blossom stems to the fruit spur, thence into the twigs and continue down until the larger limbs become infected. A case prominently illustrative of this came to the writer's attention in Fresno, where some trees in an old orchard had been removed and replaced with young trees, so there were alternate rows of old trees in full bloom and two-year-old trees, one year in the orchard, which had not yet blossomed. Every one of the old trees was blighted, while the young ones, growing in the midst of the diseased trees, were entirely untouched by the blight and were making a thrifty, healthy growth.

In the more susceptible varieties, and under conditions favorable to vigorous growth, the blight often involves the whole tree, but frequently it progresses to a place where it finds a denser wood or other conditions unfavorable to its further progress and stops short, leaving a well-defined line of demarkation between the healthy and diseased portions. The disease, too, makes its most rapid headway while the tree is making its most vigorous growth, becoming less and less virulent as the summer advances and the young growth begins to harden. In some cases, where conditions are especially favorable for wood growth, the disease will work down the twigs and branches at the rate of a foot a day, but usually its progress is at the rate of one to three inches. For various reasons the spread of the disease is sometimes checked, and occasionally the blossoms alone are affected, or the young fruit may turn black and dry up and the course of the disease stop at that, or it may involve the young twigs and not communicate to the older wood, but too often its course is unstayed until the tree attacked is ruined.



Pear-blight bacteria.

History of the Disease.—Pear-blight is not a new thing in either the United States or California. It has been known in the country for over a century, and in this State cases have been noticed for the past twenty-five years, but it has only been within the last five years that it has appeared in such destructive force in the upper San Joaquin Valley as to cause alarm for the future of the pear crop. The cause of the disease was not known before 1880, and prior to that time it was attributed to various causes (none of them correct), to conditions of the atmosphere, climatic changes, etc. Prof. T. J. Burrill, of the University of Illinois, made a special study of this disease, and in 1879 discovered that it was caused by a very minute microbe of the class Bacteria, which is known to science as *Bacillus amylovorus*, and the following proofs are given to show that the disease is caused by it: The microbes are found in immense numbers in freshly blighted twigs; they can be taken from an infected tree and cultivated in pure culture, and in this way can be kept for months at a time; by inoculating a healthy tree with these cultures the disease is produced; in a tree so inoculated the microbes are again found in abundance.

Recently M. B. Waite, of the Division of Vegetable Physiology and Pathology of the U. S. Department of Agriculture, has made a special study of pear-blight, and added much to our knowledge of the nature, spread, and control of the disease.

According to Mr. Waite: "One of the most remarkable things about this disease is the rapidity with which it spreads through an orchard at blooming time. This peculiarity has thrown much light on the way the microbes travel about, which they do quite readily, notwithstanding the fact that they are surrounded and held together and to the tree by sticky and gummy substances. They are able to live and multiply in the nectar of the blossom, from whence they are carried away by bees and other insects, which visit the blossoms in great numbers for the honey and pollen. If a few early blossoms are infected, the insects will scatter the disease from flower to flower and from tree to tree until it becomes an epidemic in the orchard. We shall see later how the first blossoms are infected. From the blossoms the disease may extend downward into the branches or run in from lateral fruit spurs so as to do a large amount of damage by girdling the limbs. Another way in which the blight gains entrance is through the tips of growing shoots. In the nursery, when trees are not flowering, this is the usual mode of infection. This is often called twig-blight, a good term to distinguish it from blossom-blight, provided that it is understood that they are simply different modes of attack of the same disease."

Bees as Carriers of the Disease.—In Kings County during the past two years there has been a great deal of controversy between the pear-growers and the beekeepers in regard to the spread of the pear-blight germs, it being claimed by the orchardists that bees spread the disease in their search for honey, visiting infested blossoms, carrying the germs to healthy trees, and in this manner spreading the disease over entire areas within the radius of their flight. There is now little question that the contention of the fruit men is largely true. The pear-blight bacillus is inclosed in a viscid, sweetish exudation, and is not spread by the wind, as is the case with fungous spores. It depends upon other means of transportation and distribution, and these means are supplied by insects to a great extent, and when bees are active they become the principal carriers of the plague. At the same time it is questionable whether the exclusion of the bees will have any noticeable effect in preventing the spread of the disease, as there are a host of other insects actively engaged in the work of carrying the germs of pear-blight from tree to tree, and it is impossible to exclude all from the orchards. In an experiment made in Kings County to test the agency of insects in spreading the pear-blight, Horticultural Commissioner Motheral reports on an attempt to exclude them from selected trees by covering the trees with mosquito netting. He says: "We found the task more difficult than we supposed. The mosquito netting was blown about by the wind and torn often, so that we found it impossible to keep out entirely the bees or other insects; but I succeeded in a measure, and as a consequence I have but little blight under the netting; while on the trees all around and all over the orchard almost all the flowers were blighted. I have, also, a fair crop on the protected trees."

The responsibility of bees for the spread of this disease was very fully dwelt upon by Professor Waite in an address at the National Beekeepers' Convention at the Pan-American Exposition. He says:

"We may say that bees are very active agents in the distribution of pear-blight. In order to understand fully, however, the exact part that bees do play in the distribution of pear-blight, it will be necessary to go very briefly over some other points concerning this disease, and to give, in fact, the life history of the pear-blight bacillus through the year.

"In the first place we have three methods by which the pear-blight germ enters the tree: first, through the blossoms, resulting in what is commonly called blossom-blight, to distinguish it from the other methods of communication of the disease; second, through the tender tips of growing twigs—but either blossom-blight or twig-blight may run down on the limbs and trunks; and, third, blight may enter directly into the fleshy bark of young trees.

"The latter is comparatively a rare method—in fact, by far the greater number of infections are directly through the blossoms.

"Now, of course, it is only in blossom-blight that the honey bee is concerned, and, furthermore, all insects which visit the pear, apple, and quince blossoms are more or less concerned in the matter of distribution on the blossoms. I may say, also, that other insects than the honey bee are largely instrumental in the distribution of pear-blight on the twigs, and we have scarcely been able to find a direct, normal method of introduction of the disease in the twigs without the introduction of some mechanical or insect puncture. Beginning with the spring of the year, the disease breaks out on the blossoms. Ordinarily, trees do not have the blight very badly until they come into bloom, and this, as I said before, is mostly due to its distribution by bees and other insects which visit the flowers and are the main factors. The pear blossom is a very open one and is extensively visited by a whole list of insects. I started out to get a list of the insects which visit pear blossoms, but when I reached the number of forty I gave it up. Nearly all the flying insects—the bee being most active of all, but even beetles and wasps, and occasionally a humming-bird, the latter, of course, not being an insect—visited the pear blossoms and carried the disease along.

"The blight begins on the blossoms in early spring; then during the summer we may have twig-blight clear into September. The disease runs down on the twigs and in the great majority of cases dies out. The disease works in the bark and as a rule finds the tree, at some time during the late spring and summer, a little too dry and tough for it to take hold of, and it dies out. Occasionally infections, however, keep running down on the twigs, get into the fleshy bark and keep on working slowly till fall. After this season of the year the trees are so moist that those germs will not dry out, but will live over winter, resulting in what I call 'hold-over blight.' It stands zero weather perfectly. In the spring the hold-over cases start off when root pressure begins and when the tree is forced full of sap. In some instances in the South very active changes go on in these hold-over cases during mild winter weather, but in the Northern States they don't have time to do much damage. The virus runs out on the sides of the tree and drops down. I saw some very fine cases in the mountains of Virginia last spring. The flies and wasps and other insects swarm on the exuding sap, and fly from that to the opening blossoms and start the infection for the next year.

"Bloom-blight, then blight running on the branches, then hold-over blight, then reinfection next spring on the blossoms. When it is started on the blossoms it is carried like fire. Now, as I started to say a moment ago, you would like to have the authentic proof that the bees carry pear-blight. I have worked long and patiently on this problem for three or four years. In the first place, the great abundance of blossom-blight leads to a suspicion, at least, that we have here some normal, effective method of distribution. There is some regular way about it, and we shall see what that method is. In the second place, the disease begins in the nectaries. The germs of the pear-blight are found growing and multiplying in this nectar. I determined this mostly by artificial infection. By taking pure cultures of the pear-blight germ and touching the nectary with a camel's-hair brush I started the pear-blight off. It requires no puncture. It is the only point on the tree where the germs enter normally without a puncture. The nectar has no shield or cuticle over it to keep out the germs.

"Now my first acquaintance with this relationship of bees to pear-blight came about something like this: When I had succeeded in isolating the pear-blight germ I immediately tested the validity of my cultures by a series of experiments with a camel's-hair brush on some blossoms, and I inoculated and labeled a number of blossoms around the lower part of a pear tree on the Agricultural Department grounds at Washington. I spent a good deal of time actually watching those blossoms growing, and, of course, here came the bees right in front of me, and as the germs began to grow in the nectaries they began to visit my infected blossoms, and I saw them fly from these over the trees to the other blossoms. I captured two bees; caught them in the act of visiting the infected blossoms, and, taking them into the laboratory, made plate cultures by the method in which we ordinarily isolate bacteria, and succeeded beautifully in isolating pear-blight germs from the mouth parts of the bees.

"In other words, we actually caught the bees in the act, and this was repeated a number of times and in different parts of the country. Now it seems as though we had matters pretty well proven. My trees that I had infected came down beautifully with pear-blight. The clusters all came down which I had infected and labeled, and a large number of others all around the tree.

"The question, then, was as to what other methods of distribution the pear-blight germ might have, and with quite an elaborate series of experiments I set about to find out the truth of the matter. The main question was whether the pear-blight germ was carried by the wind. If it could be blown by the wind it would not make any difference whether the bees carried it or not; but it was not blown by the wind, and became a matter of considerable importance. So, having gone through one spring in Washington, I moved up to western New York and passed through another spring.

"A gentleman near Brockport, N. Y., very kindly turned over a small orchard to me, in which I could start a small artificial epidemic of pear-blight. We inoculated about six or eight trees and about eight or ten small branches on each tree. Before inoculating them I covered a large portion of the tree with bags of various density—mosquito netting, cheese cloth, and paper—reasoning that by covering the trees with mosquito netting if the disease is blown by the wind it would certainly blow through the mosquito netting and appear under the bags.

"The disease gradually spread from my centers of infection, but in no case did the disease get through the mosquito netting, although a large percentage of the clusters broke down on the trees that were infected outside of the mosquito netting. We inoculated blight in the bags, and kept it in; we inoculated it outside, and kept it out.

"Now, in further support of the view that I have taken that pear-blight is not borne by the wind, we have two important facts. The first is that pear-blight virus is always a sticky mass, which can not be blown by the wind. It is a gummy material that can readily be carried by anything that touches it, but not by the wind. The second fact is that the pear-blight germs on drying rapidly die. In ordinary orchard conditions a few days after the twig dries out the germs die, so that pear-blight germs are not lying around promiscuously. We have no evidence whatever that we can get infection in any other way, so I think you will be willing to accept my proposition that bees are active agents in carrying pear-blight on blossoms, and that the blight is not carried by the wind.

"Now, we have been giving the honey bee such a bad record that it is with great pleasure that I turn to another phase of this subject. Very early in this work the question came up in my mind, if the honey bee was doing unfortunate work, what was its function on the blossoms? The question came up, are our pear blossoms of such a nature that they required this insect fertilization by the bees? So I started out to determine the relationship between the bees and the fertilization of the blossom. The result was a series of experiments lasting over three years.

"On account of the limited time, I shall have to state very briefly the results of this pollination work. In the first place it came out that most of our pears, as a result of careful hand pollination on test, are sterile to their own pollen. Cross-pollination is characteristic of our orchard fruits. It is perhaps not true of peaches and quinces, but as far as apples and pears are concerned, cross-pollination is a necessity.

"By trying a large number of experiments I concluded that insects were the largest agents in cross-pollination. The blossom of the pear is not of the type of wind-fertilization blossoms, but is distinctly of the insect-fertilized type. Now, this matter is so complicated that it will be impossible, in the short time at my disposal, to go into the details of fertilization. To make the story short, we may say that from the biological standpoint the bees are doing their normal, natural work in visiting the pear and apple blossoms. The blossoms are for the bees to pollinate, are developed by insects, and the insects have been developed in correlation to them. It is a normal biological process: the visiting of orchard fruit blossoms by bees. The bees are there performing their proper function.

"Now, the question is, Is the honey bee to be looked upon as useful or injurious? Do its beneficial effects equal its injurious effects? When there is no pear-blight about it is easily decided in favor of the usefulness of the bee; but when there is an outbreak of blight it is a rather hard question to decide.

"There are no doubt times, when pear-blight is rampant in an orchard, when it would be better not to have the honey bee or any other insect in there until the blight is past. On the other hand, from the standpoint of the beekeeper, it can be said that in most cases wild bees and other insects would do a large part of the work, both good and bad, without the honey bee; so that we could not get rid of the infection of the blight even if we do dispense with the presence of the bee.

"I feel satisfied that in the eastern United States the honey bee must be looked upon as a useful element in the orchard. I have an apiary in my own orchard. The people in California have had some terrific outbreaks of pear-blight, and are very much concerned over the matter, and they have reached the conclusion that they can dispense with the honey bee as an orchard pollenizer; that their Bartlett pears will set all the fruit that is necessary, without insect fertilization. I have never investigated the subject in California. My only knowledge of the case is due to my observation of California fruits. There are so many seedless Bartlett pears from California that it looks as if they were necessarily self-pollenized, and there may possibly be some truth in their views that their pears will set without cross-pollenization. In that case it moves the thing a little against the bee, and if pear-blight is rampant in an orchard it would certainly be desirable—at times at least—not to have bees about."

REMEDIES.

Pear-blight being of bacterial origin and spreading with the sap through the cambium layer, thoroughly protected from all outside influences, it is very evident that no external treatment can reach it, and that all forms of sprays, washes, or fumigation are valueless. There are but two methods of reaching the disease—prevention and extirpation. In those sections which the disease has not reached, every precaution against its introduction should be taken. In orchards where it has obtained a lodgment, only the most vigorous application of the saw and knife is of any avail, and even the most heroic treatment is not always successful.

It has been shown that the disease makes the slowest progress in the least thrifty trees, and that whatever means are taken to force the growth of the tree furnishes food for the disease, while whatever will tend to stop growth will also have a tendency to stop the progress of the blight. The greatest progress of the disease is made during the season of most vigorous growth, and it decreases later in the season as the wood hardens, and finally the active germs of the disease die out when the tree has completed its seasonal growth. Upon this hypothesis the following rules are laid down for dealing with the blight:

Pruning.—Pruning in the winter time, or when the tree is dormant, tends to make it grow and form a great deal of new wood, and on that account it favors pear-blight. Withholding the pruning-knife, therefore, may not otherwise be best for the tree, but it will reduce to some extent its tendency to blight.

Fertilizing.—The better a tree is fed the worse it will fare when attacked by blight. Trees highly manured with barnyard manures and other nitrogenous fertilizers are especially liable to the disease. Overstimulation with fertilizers is to be avoided, especially if the soil is already well supplied.

Cultivation.—The same remarks apply here as in the case of fertilizing. A well-cultivated tree is more inclined to blight than one growing on untilled land, although the latter often do blight badly. Generally, good tillage every year is necessary for the full development of the pear and quince trees, and is more or less so for the apple in many parts of the country, but the thrift that makes a tree bear good fruit also makes it susceptible to blight. Check the tree by withholding tillage, so that it makes a short growth and bears small fruit, and it will be in a better condition to withstand blight than it would were it cultivated. In cases where thrifty orchards are attacked by blight and are threatened with destruction, it may often be desirable to plow them once in spring and harrow soon after the plowing, to plow them only, or to entirely withhold cultivation for a year, mowing the weeds and grass or pasturing with sheep. A good way is to plow the middle of the space between the rows, leaving half the ground untouched.

Irrigation.—In irrigated orchards the grower has the advantage of having control of the water-supply. When such orchards are attacked, the proper thing to do is to withhold the water-supply or reduce it to the minimum. Only enough should be supplied to keep the leaves green and the wood from shriveling.

Extermination of the Blight Microbe.—We now come to the only really satisfactory method of controlling pear-blight—that is, exterminating the microbe which causes it, by cutting out and burning every particle of blight when the trees are dormant. Not a single case of active blight in the orchard, or within a half mile or so of it, should be allowed to survive the winter. Every tree of the pome family, including the apple, pear, quince, Siberian crabapple, wild crabapple, the mountain ash, service berry, and all the species of Cratægus, or hawthorns, should be examined for this purpose, the blight being the same in all. The orchardist should not stop short of absolute destruction of every case, for a few overlooked may go a long way toward undoing all his work. Cutting out the blight may be done at any time in the winter or spring up to the period when growth begins. The best time, however, is undoubtedly in the fall, when the foliage is still on the trees and when the contrast between that on the blighted and that on the healthy limbs is so great that it is an easy matter to find all the blight. It is important to cut out blight whenever it is found, even in the growing season. At that time of the year, however, it can not be hoped to make much headway against the disease, as new cases constantly occur which are not sufficiently developed to be seen when the cutting is done. In orchards where there are only a few trees, and the owner has sufficient time to go over them daily, he will be able to save some which would otherwise be lost. However, when the trees stop forming new wood, the campaign should begin in earnest.

"The best way to fight this disease is to prevent the blight from over-wintering by carefully going over the trees in the fall and again in the winter and early spring and removing every case of hold-over blight. The germs which are to start the infection the coming year are all in the tree within easy reach of the operator. It is only a question of skill and thoroughness on his part as to whether they are allowed to survive or not. It is usually best to go over the trees in summer as well, and make a fight against the blight during the growing season. This, however, is not as easy to do successfully as to cut it out in the fall, for the reason that new infections are continually taking place during the growing season and new cases of blight may already be in the tree but not sufficiently developed to attract the attention of the operator. In cutting out the blight great care must always be taken to cut on healthy wood well below the lowest point discolored by the disease. It is usually safer to cut at least a foot or more on apparently sound wood, although by carefully studying the case it may not be necessary to go so far below. An important matter in cutting out the blight is to carry along some disinfecting solution with which to sterilize the knife or other tools used. For this purpose, Professor Waite recommends any of the following solutions to be used: Mercuric chloride, or corrosive sublimate, 1 part to 1,000 parts of water; 5 per cent carbolic acid solution; or a solution of chloride of lime. The first may be prepared by purchasing tablets of a definite amount at a drug store. These tablets can be kept in a small bottle, and a pint or quart bottle filled with water and one of the tablets added. Upon concluding work the bottle should be emptied, to avoid the danger of poisoning children or unsuspecting persons. By this means the danger of using this deadly poison may be avoided. Carbolic-acid solution may be prepared by simply adding a tablespoonful or more to a bottle of water and shaking it up. The saturated solution, which contains about 5 per cent of carbolic acid, is the proper strength to use. A solution of chloride of lime will answer about the same purpose, and is made by adding about twenty parts of water to one part of the commercial chloride of lime, shaking it up and pouring off the clear liquid. This is only fit for using while fresh. Any of these solutions can be carried by the operator, and a strip of cloth a yard or so in length should be fastened to the clothing, leaving one end hanging free. When cutting into active blight, the ends of the cloth may be kept saturated with the disinfectant and the knife sterilized by wiping before using it on the sound wood. It is also better to wipe off the wound on the sound wood with the saturated cloth, otherwise there will be the danger of leaving the blight germs on the cut surface and merely starting the blight over again. A knife used to cut into blighting tissue becomes subsequently a veritable inoculating instrument, and should always be sterilized before use on healthy tissues."

CONCLUSIONS.

Pear-blight is limited in its destructive work to the counties of the southern portions of the State, and does not exist to a dangerous extent north of Fresno.

The disease is the most insidious and destructive that has appeared in our orchards.

Its principal point of entry is through the blossoms and its progress is downward, varying in speed from an inch to several inches daily.

The healthiest trees, those making the most vigorous growth, are the most susceptible to attack.

The pear is not the only tree attacked by blight, but the disease is common to the whole pomaceous family.

The disease is of bacterial origin, due to the presence of a microbe known as *Bacillus amylovorus.*

It is spread by bees and other insects, which carry the germs from diseased to healthy trees.

The bacillus dies out when the growth stops and the wood hardens.

The most effective preventive methods are neglect of the tree, and the stoppage of its growth.

Sprays and washes are utterly ineffective and useless as remedies.

Vigorous cutting out of all diseased wood, well below the point of infection, is the only remedy that can be recommended.

All tools and implements used for pruning diseased trees should be carefully disinfected before they are again used, or they may become instruments in spreading the disease.

THE OLIVE-KNOT IN CALIFORNIA.

The attention of this Board having been called to what appeared to be a threatening disease of the olive—tuberculosis of the olive, or olive-knot—an agent of the Board was instructed to visit the different olive sections to ascertain the extent and spread of the disease, with a view to checking its further progress.

The olive-knot is one of the most serious diseases that can attack the olive tree, involving, as it does, the entire structure, being confined to no special portion, but breaking out on all parts from roots to leaves. There is but one sure and safe plan, and that is the total destruction of the infected tree. Fortunately, the disease has not as yet obtained a serious foothold in this State, and radical measures have already been taken to stamp it out.

The disease, although known in Europe for many years past, was first reported in this State from Merced County, where it had broken out in an orchard belonging to A. R. Gurr, who noticed its appearance on one of his trees in 1893, from which it spread to adjoining ones and finally attacked a large number of trees in his orchard. These trees have all been rooted out and destroyed with the exception of three, which, standing in an isolated spot, remote from any other olive trees, the owner has left in order to study the progress of the disease. The remaining trees are a Nevadillo, a Picholine, and a Mission, and all are affected with the knot, the Nevadillo showing it in its worst form and the Mission being the least injured. In this section the disease is practically under control, and while the existence of the infected trees implies more or less possibilities of its transmission to other sections, still, being isolated as they are, the danger is reduced to a minimum.

Another and more serious outbreak was reported to the Board early in 1901 from the Maywood Colony, in Tehama County, and Alexander Craw, Quarantine Officer of the Board, was delegated to make an investigation and advise with the owners of the olive orchards there as to a course of action. In his annual report to the Board, Mr. Craw says:

"According to your instructions, I visited Tehama County on June 3d and 4th, and investigated the reported existence of the 'olive-knot' (*Bacillus oleæ*) in several young orchards. With Mr. Harvey C. Stiles, I visited a number of young olive orchards, and although we found

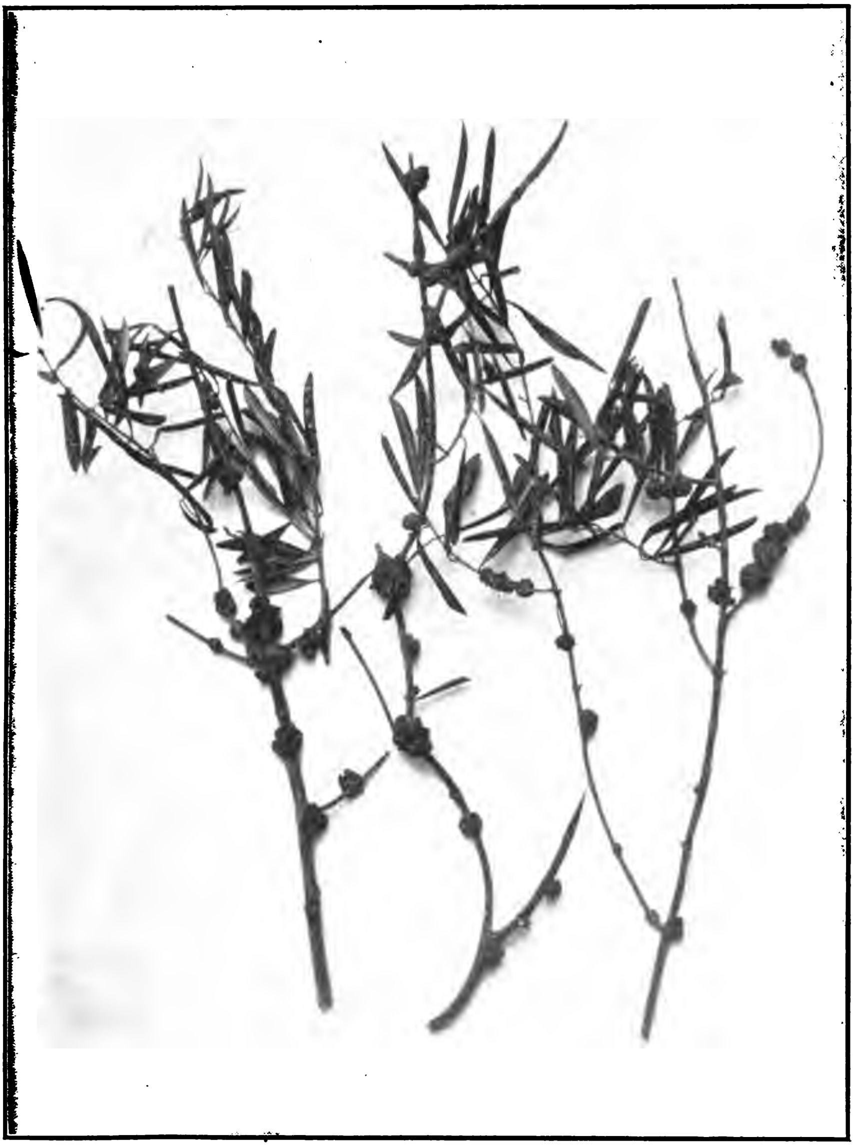


PLATE I. OLIVE-KNOT (*Bacillus oleæ*) AFFECTING TWIGS AND LEAVES.

indications of the disease, there was no appearance of any virulent cases. This may be owing to the fact that the trees had been planted within the year. It was the desire of a number of the orchardists to have the disease stamped out of the county if possible, and as they anticipated some opposition on the part of non-resident owners, I submitted the matter to the Attorney-General to ascertain if the County Horticultural Commissioners or the State Board of Horticulture could take any action toward stamping this disease out of that and other counties where it has appeared. The opinion of the Attorney-General is given on pages 53 to 57 inclusive, of your bulletin, 'Horticultural Statutes of California.' It would appear that the County Horticultural Commissioners have power to abate such nuisances in their respective counties. There is nothing, however, in our statutes conferring such power upon the State Board of Horticulture. It is to be hoped that the County Horticultural Commissioners will see that the destructive olive disease is stamped out of the State."

In October of the present year a special agent of the Board visited the infected section, and, in company with Mr. Woodson and Horticultural Commissioner A. W. Samson, made a thorough investigation of the whole district, visiting the various olive orchards and inspecting a large number of trees, but no case of olive-knot could be found. The Horticultural Commission, aided by the owners and the Colony association, had taken the matter vigorously in hand and entirely extirpated the disease. A thorough inspection of each orchard had been made, and every tree which gave any evidence of disease had been removed and burned, and the ground where it stood had been disinfected and left exposed to the air, no other tree being planted near it. The only varieties infected were Nevadillo and Manzanillo. These were all purchased from one nursery, and it is supposed that the trees had the germs of the disease when planted, which was in 1899. The disease appeared soon after this, and in 1901 all the infected trees were removed. As there has been no indication of the disease since that time, it is believed to have been eradicated.

The work done is to be commended, as there are over 300,000 olive trees in this colony, and the olive industry is a very promising one. There were among these, 781 trees that indicated the olive-knot beyond question, and the early destruction of these, with subsequent precautionary measures against further outbreaks, has unquestionably saved the orchards in this district from a terrible scourge.

Later, under the guidance of Mr. Harvey Stiles, of Chico, orchards in Butte County were visited and found seriously affected with the olive-knot. In Mr. Woodward's orchard near Chico, where the disease had been especially bad, a great part of the trees had been removed and destroyed, but all that remained were affected—the Mission less so than

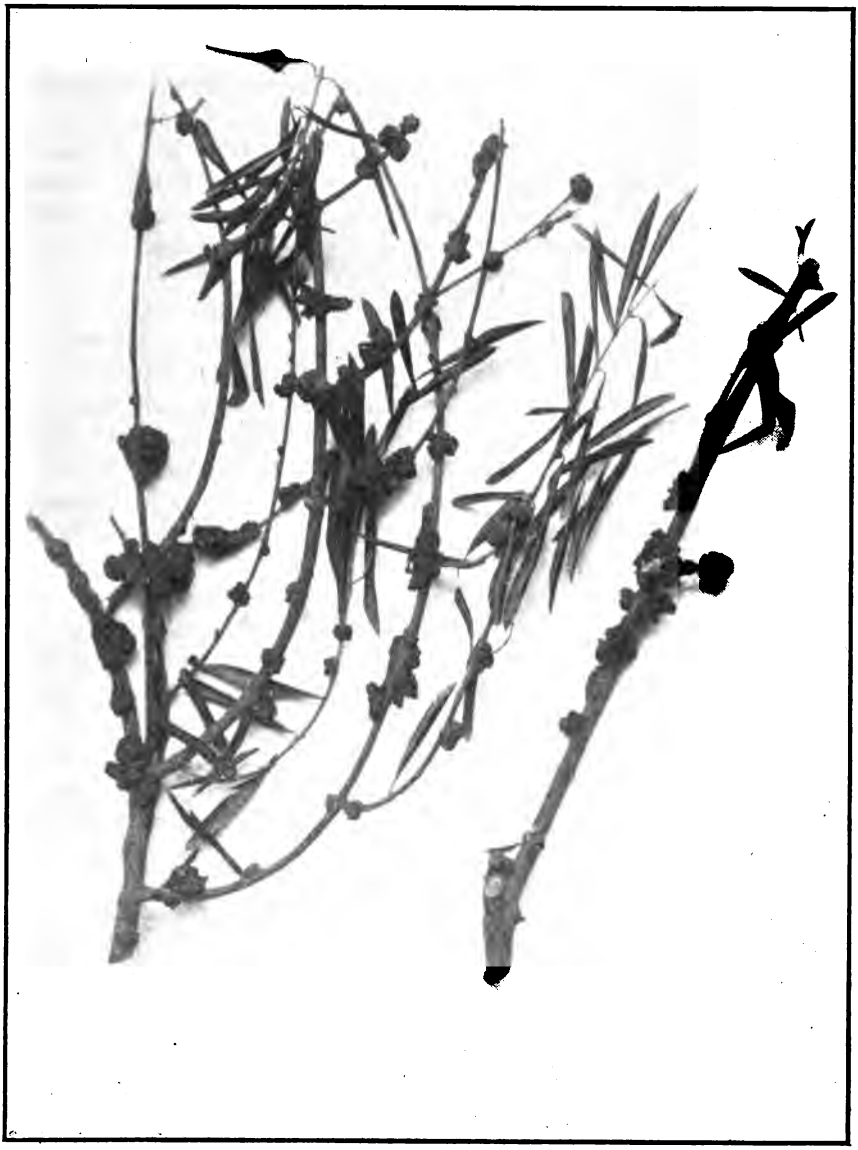


PLATE II. AN ADVANCED CASE OF OLIVE-KNOT (*Bacillus oleæ*) ON TWIGS.

any of the other varieties, which included Nevadillo, Rubra, Macrocarpa, and Columella. This orchard contained twenty acres, upon which at least one half the trees had been destroyed and removed. Mr. Stiles, who has made an extensive study of this disease in his section, furnishes the following information in relation thereto:

"The 'European' olive-knot, sometimes called 'tuberculosis of the olive,' the result of the attacks of *Bacillus oleæ*, is now prevalent in several sections of California. This disease came to notice in 1893, and by 1898 had spread so rapidly that nearly all the trees in the orchard were affected and some completely ruined. Soon thereafter the orchard was destroyed by the advice of horticultural authorities, and it was supposed that the disease was eradicated from the State. The Agricultural Department of the State University issued that year a bulletin (No. 120) on the subject, followed in 1900 by 'Condition of Olive Culture in California' (Bulletin No. 129), in which the matter was followed and conclusions drawn that the disease was probably not existent. In April, 1891, I discovered it in young orchards, and had soon located it in about fifty orchards in one locality. I immediately had it identified by Professor Bioletti of the State University and Professor Pierce, of the United States Department of Agriculture, and have since found it in several widely distant localities. I early began to search for the source of the infection, and have now succeeded in tracing every case that I found to one importation of foreign trees propagated from and sold throughout the State by one nursery. One other case is reported of an importation of trees that were infested with the knot when they arrived, but evidently the disease was destroyed there, for no cases of infection are reported from them. The disease seems to spread very rapidly and to assume more virulence here than in Europe. It develops also very seriously on the roots rather than on the top principally, as the writings denote. Trees have been entirely destroyed by it in three or four years after planting, but these cases undoubtedly had it when planted.

"The inspections have covered fully 400,000 olive trees in a dozen widely separated localities, and constantly I have found Missions growing among or alongside infected trees of the other varieties, and mostly unaffected. In most cases they were grown in the same nursery as the infected trees, shipped together in the same car (often in the same bales), were cultivated and pruned by the same set of tools, and otherwise exposed in every possible, practical way to orchard or nursery inoculation. Though Professor Bioletti's experiments have shown beyond a question the possibility of forced inoculations (see Report of State Board of Horticulture, 1899), I think this multitude of evidence is pretty conclusive that the Mission is at least strongly, practically resistant, though not actually immune. I know one orchard of Missions

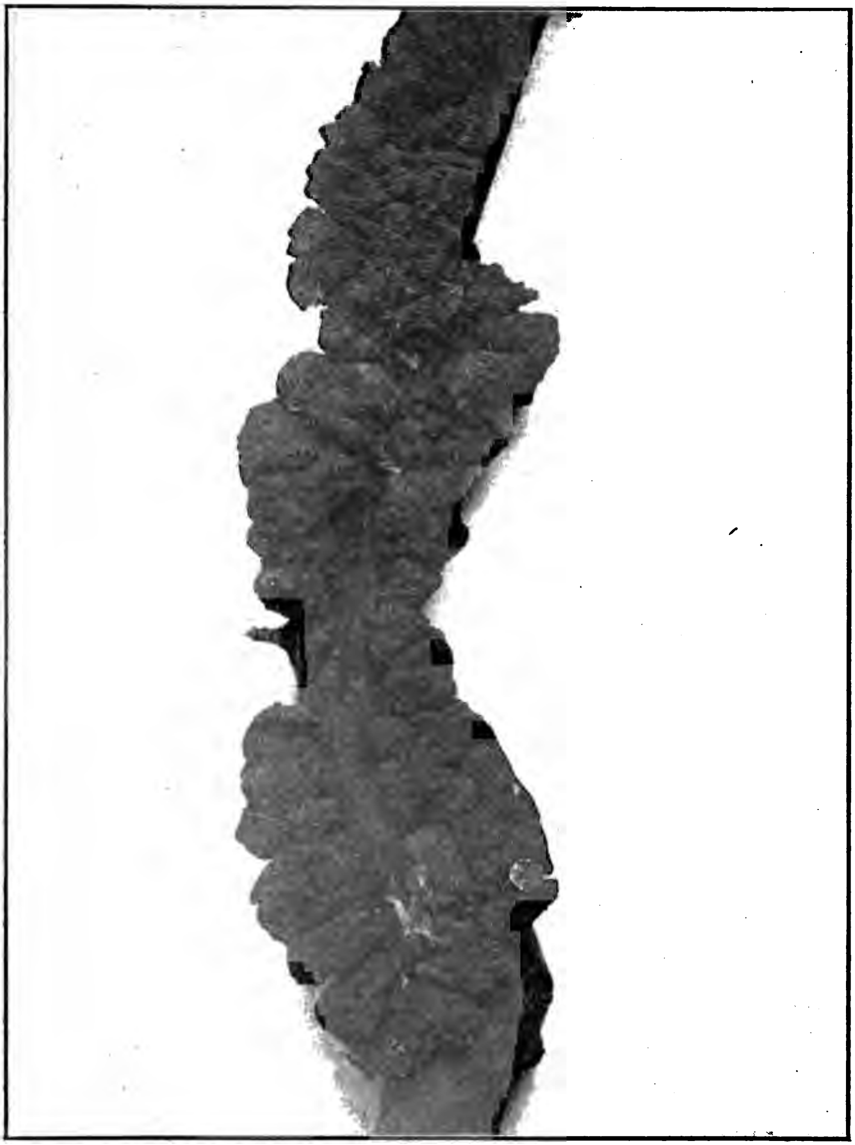


PLATE III. FULLY DEVELOPED CASE OF OLIVE-KNOT (*Bacillus oleæ*) ON BRANCH.

growing—entirely unaffected—alongside several hundred trees of Rubra, every tree of which latter is affected, many of them killed. There are trees with literally tens of thousands of knots, in most active stages of development, standing only a few feet from the Missions, and, as in the other cases, both varieties have had a common nursery origin, and have been shipped, pruned, and cultivated in common, and the Missions thereby exposed to every possible practical infection."

Attention was first directed to this disease in the United States by Professor Newton B. Pierce, of Santa Ana, who published a description of it in the Journal of Mycology in 1891. During his researches in Europe, Professor Pierce found the disease quite common in some sections around the Mediterranean, and drew the attention of California to its danger. In his report he says:

"The tubercle of the olive is an excrescence upon the limb of the tree which pardonably might at first be mistaken for an insect gall. These excrescences or tumors are quite variable in size; probably most of them are mature before reaching an inch in diameter, but some become large, coarse knots. Many branches cease to grow, in whole or in part, beyond the tubercle, after the latter has become partially developed. Some branches become stunted, while others die entirely toward the end. Hence, the growth of the tubercle is largely limited by the life and vigor of the limb bearing it.

"Dr. Savastano says that the tubercles occur upon branches from one to fifteen years of age. In forming, the tubercle commonly takes its origin quite near the cambium zone, though more frequently the center of the bacteria begins to form in the liber portions of the fibro-vascular bundles. To the unaided eye the forming center appears like a very small transparent spot, which, under magnification of one thousand diameters, shows the colony of bacteria already formed. There is now manifest about the colony a hypertrophy of the elements, which may become more or less profoundly altered. As the colony enlarges the hypertrophy increases. The tubercle grows until in time it cracks through the exterior bark. When the tubercle is formed its growth is not usually arrested, but it continues to increase more or less in size each year, often attaining a diameter of 0.01 to 0.02 meter (two fifths to four fifths of an inch). The tubercle is formed in the spring; during the heat of the summer the hypertrophy is arrested, but the colony of bacteria increases considerably. Then, during the autumn renewal of growth, the hypertrophy begins again.

"The irritation or stimulation caused by the presence of the bacillus, so far as our observations have extended, produces only a localized growth of tissue. There is scarcely more evidence of a general or constitutional disorder of the sap of the tree affected than is produced in the oak under the action of the Cynipidæ. The stimulation of the affected branch scarcely extends beyond the node or internode where the swelling occurs. The impoverishing action of this growth, however, is often plainly observed on the entire twig beyond the tubercle. The limb sometimes shows a marked reduction in diameter, though perhaps green and healthy in other respects. In a majority of cases the enlargement only involves one side of the branch. It is not uncommon to find two centers of inoculation producing coalescing tubercles; but the distinction of origin is rarely lost. So far as I am aware, progressive death of the limb below the point of infection, as is the case with pear-blight, never occurs. There is no analogous and general pathogenic degeneration of the tissues, as found in limbs affected by that disease.

"From some of my first observations, where I found the tubercle developing at the node of the limb, I thought it likely that inoculation had been effected by means of the axillary buds. Later, however, many tubercles were noticed, located by internodes, and having no connection with the leaf axil. This has left the method of entrance of the bacillus obscured, unless, perchance, it be through the growing point, and continued growth has left it within the internode or at the node. This explanation seems more probable than that the organism has directly penetrated the bark of the branch. It is also rather indorsed than otherwise by the fact that whenever mechanical injury has occurred to the bark, laying bare the cambium tissue, the tumors are often unusually numerous. They are most common when a bud or leaf or branch has been broken off, or where some injury or splitting of the branch has occurred. In one case observed, where a branch had been split for a few inches, three distinct centers of inoculation were seen at the edge of the ruptured bark within the distance of two inches. Undoubtedly, however, inoculation may occur through slight cracking or other injury of the bark.

"The local and general distribution of tuberculosis of the olive is peculiar and interesting. There is no such sweeping and complete infection accomplished by this disease as is the case in the spread of many germ diseases. I was told that near Genoa the disease is very common and quite destructive. At Rome I visited an olive grove near Colonna, some sixteen miles from the city and north of the Alban hills. In company with Professor Cuboni, I made careful search for this disease, and only obtained a single tumor from a considerable number of trees examined. Another case somewhat similar occurred at Portici. The agricultural school building there was formerly a royal residence, and retains back of it an extensive park, which was fitted up in connection with the residence or palace. Here is an extensive olive grove. Dr. Savastano, his assistant, and myself searched through this grove for some time for tubercles, only finding, at last, a few on the upper limbs of a single tree. At Cancello, some twelve to fifteen miles north of

Vesuvius, is a large olive grove covering the hills at that place. I here spent several hours in a fruitless search for this disease. At Palma, about an equal distance southeast of Cancello, the trees were quite badly infected. Upon a single small branch I counted not less than twenty-nine swellings. All about the hills north of Messina, Sicily, especially in the neighborhood of Faro, the olives are badly infected, and in one or two cases nearly the entire top of the infected tree was ruined. In the province of Syracuse, where olives are largely grown, and where they are very old and thrifty, no signs of this disease were seen. At Palermo, northwest Sicily, it was again encountered, and noted as being the worst phase of the disease seen up to that time. In Algeria I did not encounter the trouble, but have little doubt of its existence there, as well as in all of the Mediterranean olive-growing countries. It exists in France. My observations show me that the disease is very irregular in its distribution. One olive grove may be free from it, or nearly so, while another, not far distant, may be badly infected. One tree in a grove may be, apparently, the only one infected. Again, the disease may be localized upon one portion of a single tree. Probably nothing short of a clear understanding of the means of distribution and infection will explain these facts.

"Careful attention to the excision of all affected branches is apparently all that is required to keep this affection from spreading and doing serious damage.

"As the olive industry is becoming one of importance on the Pacific Coast, it is well that those interested should have the facts relative to the various enemies of that industry placed before them. In this way they may become familiar with those diseases not yet affecting their groves, and may take steps which will prove an ounce of prevention, worth more than a pound of cure."

The disease has been known in Europe for many ages, but not until within the last century did it attract attention on account of its destructive qualities. The improvement of the olive, followed by more careful cultivation, produced trees more susceptible to the disease, and it began to force itself on our attention as a problem to be met and solved. Dr. Luigi Savastano, Professor of Arboriculture, of the Royal High School of Agriculture, at Portici, Italy, has made an especial study of this disease, which he describes as follows:

"The tubercles which characterize this disease are generally formed on branches of from one to fifteen years of age, where the bark is still smooth and not cracked. They are generally isolated, but sometimes take the miliary form. They are rare on the roots, and still more so on the leaves and fruit. So far I have not found them on the flowers, but believe they may occur there.

"The formation of a tubercle takes place in the following manner:

Generally, quite close to the cambium layer, and most frequently in the bast, a colony of bacteria commences to form. To the unaided eye it appears as a small transparent spot. With a magnification of one thousand diameters this is seen to be a colony of bacteria. At the same time a hypertrophy of more or less degenerated elements commences to form around this colony. The colony increases in size and becomes dark-colored. The hypertrophy increases, causing the tubercle to enlarge and finally burst through the cortex, and split. A tubercle, thus formed, continues to grow each year more or less, until it attains a diameter of from one to two centimeters. The tubercles commence to form in the spring; during the heat of summer the hypertrophy is arrested, but the colony of bacteria continues to increase. Later, during the autumn vegetative growth, the hypertrophy recommences. In the fruit there is no true hypertrophy."

A number of experiments were made with a view to determining the methods of spreading the disease and the susceptibility of the different varieties, and Dr. Savastano summarized the results of his experiments as follows: "(1) Wounds do not cause tubercles, except on plants which are already predisposed to the disease; (2) Even in these plants a wound does not always cause the formation of tubercles; (3) Heavy pruning causes the formation of new tubercles, and an increase in size of the old ones on affected trees; (4) The formation of tubercles is in direct ratio to the vigor of the plant."

The formation of the knots on the tree is the result of an effort on the part of nature to repair the damage done by the bacteria. These, forming in colonies, seriously injure the portion of the tree in which they locate, working directly on the sapwood. As this is destroyed, nature endeavors to repair the damage by forming a new growth to heal over the wounds. This new growth supplies the bacteria with fresh material upon which to work, and the disease, instead of being checked, is spread by the very vigor of the tree. It is for this reason that the most vigorous trees suffer most from the attacks of the disease. Trees growing in good soil, under favorable conditions, well cared for, and responding well to their favorable conditions, are those which suffer most from the attacks of *Bacillus oleæ*.

There are several different forms of knots or calluses which are common to the olive tree and which do not indicate the existence of disease, although they are sometimes mistaken for the knot caused by the bacteria. When once seen, however, the genuine olive-knot, which is rough and warty in appearance, can never be mistaken, and our illustrations give the reader a very good idea of its appearance.

Conclusions.—The olive-knot (*Bacillus oleæ*) is at present confined to a comparatively limited area in this State.

The disease is not spreading, but owing to the destruction of diseased trees is being brought under control.

The most efficient remedy would be the destruction of these trees, and of all others in which any symptoms of the disease may hereafter be found.

No varieties are immune from its attacks, although the more delicate varieties are most susceptible.

The Mission olive is more resistant than any other variety, and is in little danger of infestation, unless the disease is carried to it from infected trees in pruning or cultivating with infected implements.

Trees grown under the best conditions and making the most vigorous growth are more subject to attack than those which are neglected.

Whatever stimulates the growth of the tree favors the spread of the disease.

ROOT-KNOT OF PLUM, PRUNE, AND PEACH TREES.

Root-knot has been more than usually prevalent in some localities during the present season, attacking peach, plum, prune, and almond trees and especially those grafted on plum stock, which seem more susceptible to attack than other varieties, although all are liable. There are several forms of this disease and the causes are as various as the disease. One of the most insidious and troublesome forms of the disease is the so-called beaded root-knot, which shows in a mass of small swellings or tubercles strung along the fibrous roots like beads on a string, whence its common name. This form is due to the attacks of a small nematode worm, microscopic in size, which increases with wonderful rapidity and soon involves the whole root-system of the tree attacked. This form is not often met with here, and when discovered on nursery stock or orchard trees, should be at once eradicated by the entire destruction by fire of the plant on which it exists.

A more common form of root-knot manifests itself in large tubercles on the main roots, especially where they branch from the trunk of the tree, and frequently involving the whole trunk near the ground. Root-knots are sometimes due to fungous growths, in which soil conditions and the constitutional predisposition of the tree aid materially, while other forms will sometimes follow a mechanical injury.

In nursery stock all galled trees should be burned at once, as they are not only unfit for planting, but will become the cause of spreading the disease to otherwise healthy trees. It is worse than a waste of time to plant out diseased trees, and any effort to save them is foolishness. Where the common root-knot is found in the orchard, the trees may be saved for some time by removing the soil from the diseased portions and cutting away the knots with a sharp chisel. Trees may live for several years and give profitable crops even after they have developed the disease, but most efforts at a permanent cure have proved futile. Where the knot has girdled the tree it is of no use to endeavor to save it, and it might better be removed and burned. Whenever a tree has been removed for root-knot, no other tree should be planted in its place until all danger from contagion is past. The soil should be exposed to the air and thoroughly mixed with quicklime and left for a year or more.

Several years ago W. Egbert Smith carried on a series of experiments for the treatment of root-knot, and in some cases with apparent success, and we give his method and its results in his own language:

I found that the root-knot is attached by quite a small foot-stalk, or root-of-the-knot, which extends quite deeply into the stock or root of the tree. This root-of-the-knot, or core as it may be called, can be traced by a discoloration and softening of the wood substance. Owing to this fact it is quite difficult to entirely remove the diseased wood. I found it so, especially when clusters of knots were found—some as large as a man's fist—growing under the base of the main roots, as well as around the principal root stem. This kind of work was not only tedious, but, as I found later, was quite discouraging; because young knots rapidly grew again the next year from the same core. Observing the soft and spongy nature of the knot led me to think that the application of some substance in fluid form might penetrate and kill the diseased wood without injuring the healthy wood. I determined to make some experiments in this line at once.

For these experiments I selected common substances, not with any theory about their particular chemical action, but rather because they would be cheap and easily applied, if successful, and because they were somewhat used by orchardists for other purposes. The chosen list embraced sulphuric acid, carbolic acid, petroleum, coal tar, cupric sulphate, ferric sulphate, sodium chloride, and potassium carbonate. About a dozen of the worst affected trees were selected for treatment, and wooden tags were prepared with the names of each substance to be applied; also, the date of treatment, October 31, 1890, was written on each tag. The acids were each diluted with water one half. The sulphates, chloride, and carbonate were dissolved in water to a saturated solution. The application of these fluids was made by boring into the root-knots with a carpenter's brace and three-eighths bit. I aimed to bore to the core of the knot. Then, from small bottles I poured these holes full of the prepared fluids, attaching the tags to branches at the base of each tree, as the work proceeded. The soil was then thrown back to the tree, and no further special attention was given them until the fall of the next year.

In the fall they were examined and some trees found dead, some alive, with the knots alive, also—and some alive with the knots dead. This last named and much desired result has occurred with two trees treated with the saturated solution of cupric sulphate (bluestone) and with one tree, the only one, treated with dilute carbolic acid. The result encouraged me to make further tests with each of these two solutions. Not knowing yet whether it would be "kill or cure" with my medicine, I deemed it wise to treat ten trees only with the bluestone solution and five trees only with the dilute carbolic acid in the fall of 1891. At the end of another year, I found these trees all living, with the knots dried up and dead. A difference, however, was observed between trees treated. Those treated with carbolic acid seemed to have suffered some in vitality and growth, and I noticed that certain roots were killed by the carbolic acid. In cases of bluestone treatment, the trees all appeared vigorous and healthy. I now felt that I could safely treat all my trees affected with root-knot, with an application of the bluestone solution.

Accordingly, on the 13th day of September, 1892, I set a man to work digging away the soil from all my prune trees on Myrobalan stock; those on peach stock were examined only long enough to prove that they were free from root-knot. Of five hundred trees on Myrobalan stock, about two hundred were found with root-knots. All such were treated with the bluestone solution. Our work was confined to the main root stem, including the forks of the root. We did not attempt to follow the roots in their ramifications after they leave the base of the tree. The principal damage from root-knot appears to occur only when the knots approach the crown of the root; when they encircle the crown of the root, the tree is hardly worth saving. Hence, where root-knots exist they should be destroyed early, at least before they encompass the root crown. As to the method of the work, I will say, that as fast as the knots were uncovered by the man with the shovel and trowel, I followed with brace and bit, and a large bottle of concentrated solution of bluestone. In the cork of the bottle a quill was fixed to guide the fluid easily in the bored holes. After two days' work this method of treatment was modified. A curious and interesting thing occurred. I noticed that the leaves on certain branches of trees treated the first day had turned very dark, with a sort of coppery tint which was very noticeable. These leaves dried up shortly and fell off, leaving the branches naked, while other branches on the same trees retained their green leaves. Not one tree only, but a score of them were showing this strange effect of the cupric solution. With those dead, copper-hued leaves before my eyes, there was little room for doubting that the cupric fluid had thus quickly entered into the circulation of the tree. It must have done so to produce the effect observed. And it must have gone up at a season when we speak of the sap as going down. I was a little scared at this phenomenon, and modified my treatment by striking off the knots and puncturing the diseased wood, especially the core of the knot, with a sharp pointed iron, then applying the cupric solution with a swab—in this way avoiding too excessive a quantity of the fluid penetrating the fiber of the tree. However, in the light of future events, there seemed to be no need of this precaution. The trees thus curiously and it would seem seriously affected, were all right in bud, leaf, blossom, and fruit in the spring and summer following. They have shown no sign of injury since, but on the contrary seem to have taken on a healthier tone than the other trees, so that I now believe the treatment by boring is perfectly safe, if done in September or October. I could not vouch for it at other seasons of the year.

After two years not one of the two hundred trees has died. Every tree treated was marked by tying a strip of cotton cloth on a south side branch next to the trunk of the tree. These marks still remain. Only last week I dug away the earth from about twenty of these marked trees and found *dead* knots only. The trees treated for root-knot now look as clean and healthy as those not treated—no difference can be seen; they all made a splendid growth last year, and no finer trees of the same age can be seen in our section. In the light of these facts, I consider the treatment with bluestone, in the manner herein described, a success. Even if the knots should reappear after three or four years, it would still be profitable to apply this remedy to keep the knot growth in check. The cost of application need not be more than three to five cents per tree, and the bluestone used is so trifling in quantity that it need not be considered in the bill of expense. My treatment of root-knot has always been in the fall months of the year. Whether other seasons would do as well, or better, I am not prepared to say.

In using this remedy my advice is to make the bluestone solution as strong as the water will dissolve.

In applying the solution be sure that it penetrates the core of the root-knot.

If the knot is on the main stem of the root, so as to be easily accessible, I would advise knocking it off and puncturing the soft core repeatedly with any pointed instrument. Then apply the solution with a swab. Be thorough in having the solution penetrate the diseased wood.

In case the knot is difficult to reach—embedded between roots, or deep—bore into it with brace and small bit; aim at the core; then fill the hole or holes with the solution from a stoppered bottle with a quill in the stopper.

Examine your trees below the surface, if you have reason to suspect root-knot. Apply the remedy before the knots have reached the crown of the root and, by encircling the tree at this point, have permanently injured and dwarfed the tree. There comes a time when, if root-knots are neglected, the tree will not be worth saving.

ASPARAGUS RUST.

The culture of asparagus in this State during the past few years has been developing at a rapid rate, until now it is a very important industry, particularly on the bottom lands of the Sacramento and San Joaquin rivers.

Up to a very recent period asparagus was grown for local consumption, very little, comparatively, being shipped East. The earliest beds cultivated, of any great extent, were those located east of Agricultural Park in Sacramento, from which the markets of San Francisco were principally supplied.

But the area now in cultivation on the islands and mainland of Sacramento and San Joaquin counties is numbered by the hundreds and thousands of acres, and the quality of the vegetable is superior to any produced elsewhere. On Bouldin Island there is one bed of 1,000 acres, from which were shipped in one season over one hundred cars in the fresh state, besides hundreds of thousands of cases which were canned and shipped from the same field to almost every point in the world.

What has aided this industry in a great measure, besides the superiority of the asparagus produced here, has been the almost annihilation of the industry over nearly the whole region east of the Rocky Mountains by the asparagus rust (*Puccinia asparagi*, DC.), and the failure, thus far, to discover any efficient and practical remedy for it.

It first appeared in the asparagus beds on the Atlantic seaboard in 1896, being doubtless imported from Europe, where it has long been known, and has spread since that date over a vast area. The rust has been known to scientists for about one hundred years.

In Bulletin No. 129, of the New Jersey Experiment Station, is the following, relative to the asparagus rust:

"The rust is caused by a fungus, the mycelium of which grows beneath the epidermis, sapping the vitality of the plant, finally lifting and rupturing the epidermis as if blistered, giving a brown appearance to the plants, which is due to the multitude of spores borne upon the tips of fine threads of the fungus, which aggregate at certain points and cause the spot. The threads from which the spores are produced are exceedingly small and grow through the substance of the stem, taking up nourishment and causing an enfeebled condition of the victim, which results in loss of the green color and the final rustiness of the plant. These spores are carried by the wind to other plants, where new diseased spots are produced; but as the autumn advances a final form of spores appears in the ruptures that is quite different in shape and color from the first ones produced through the summer.

"There is another form of rust which the fungus assumes, not usually seen in the asparagus field, but which may be found in early spring upon plants that are not subject to cutting. This is the cluster-cup stage, so named because the fungus produces minute cups from the asparagus stem and in small groups of a dozen or fifty, making usually an oval spot easily seen with the naked eye. This stage of the fungus comes first in the order of time in the series, and is met with on volunteer plants that may grow along the roadside or fence row in a field where all the old asparagus plants have not been destroyed.

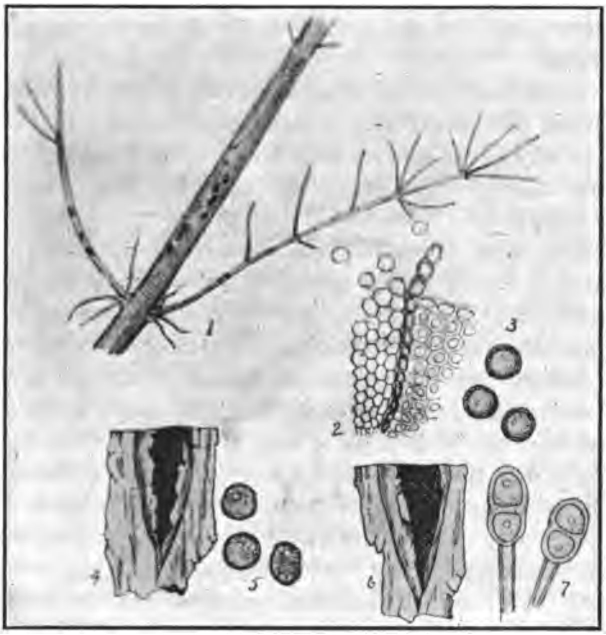


FIGURE 1.

1. General appearance of Asparagus Rust. 2. Æcidium or cluster-cup stage; 3. Spores; 4, 5. Uredo sorus and spores; 6. Teleuto sorus; 7. Teleuto spores. (1, King; the other figures after Halsted.)

"A parasite has been frequently seen upon the uredo form of the asparagus rust. This is a fungus bearing the name *Darluca filum*, Cart., that is well understood as preying upon the rusts generally. To the naked eye, the fungus, as seen in the field, gives the rusty plant a moldy appearance. This light gray color is due to multitudes of fine

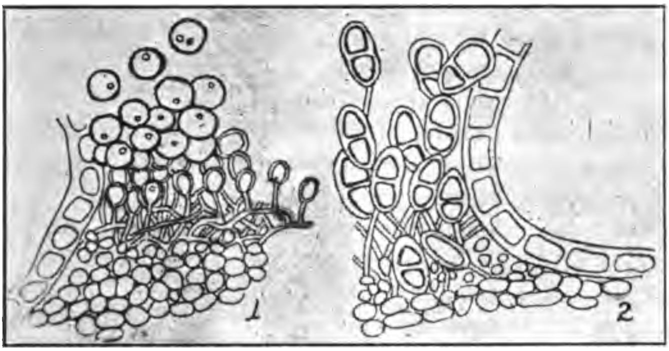


FIGURE 2.

1. Uredo sorus, with spores and mycelium. 2. Teleuto sorus and teleuto spores and mycelium. (After Halsted.)

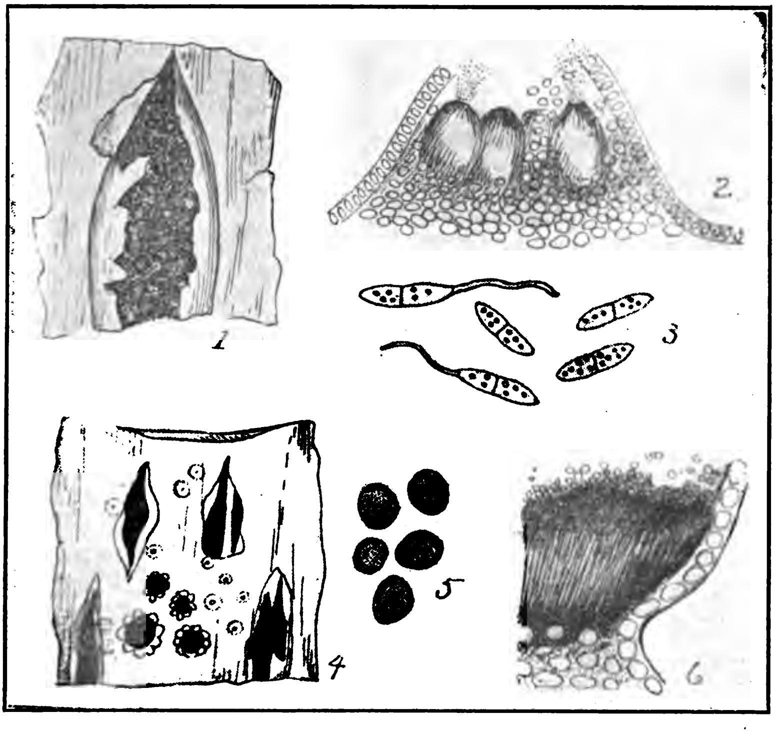


FIGURE 3.

1, 2, 3. *Darluca filum:* 1. Infected sorus: 2. Cross-section showing pycnidia and spores; 3. Spores magnified, two showing germ tubes. 4, 5, 6. *Tubercularia persicina:* 4. Parasite in sorus of rust; 5. Spores of parasite, magnified; 6. Section through sorus, showing parasite with spores. (After Halsted.)

curved threads that ooze out of the more deeply seated portion of the fungus. When these minute spirals, made up of spores that, with the accompanying jelly, are pushed out of the spore cavities, are washed away by rains, the stems appear covered with minute dark pimples, which are the spore cavities of the fungus. The fine threads of the *Darluca* fasten themselves upon those of the rust, and there finally result the structures for spore production.

"The two fungi, namely, the rust that feeds upon the sap of the asparagus, and the *Darluca* that gets its nourishment from the filaments of the rust, are quite unlike in many things. Both are fungi; both are found in the same diseased spots of the asparagus; but under the microscope the differences are as great as between asparagus and onions.

" In some localities, this parasite upon the asparagus rust has been so abundant as to make it difficult to find a fully developed rust spot free from *Darluca filum.* It is impossible to make any statement as to the favorable effect its presence may have on the following crop."

The Delaware Agricultural Experiment Station, in Bulletin No. 57, issued in June, 1902, recommends the following preventive measure:

" During the season of 1901 asparagus rust has not been as destructive as during the preceding summers, but has at all times been serious enough to command a careful consideration as to its control. The experiments conducted by the New York station, together with a trial made under the auspices of the Delaware station during the summer of 1901, warrant us in recommending Bordeaux mixture as a rust preventive. On account of the difficulty in getting the latter mixture to adhere to the foliage, it is advisable to use rosin soap at the rate of two pounds to the barrel. The rosin soap is prepared as follows: Dissolve seven pounds of sal-soda or washing soda in four or five gallons of water, and boil; then add ten pounds of rosin, and continue the boiling about half an hour, or until the rosin is completely dissolved, and there results a yellow soap in the bottom with a clear, brown supernatant liquid above. The supernatant liquid is poured off and the soap collected. Dissolve two pounds of the soap in the necessary quantity of water and add to the Bordeaux mixture, which is prepared in the ordinary way. The first application would be made in that section about the middle of July, and repeated two weeks later. The economical spraying of asparagus demands a specially devised spraying outfit, and should consist of a cart with wheels sufficiently high so that the axles will brush the tops of the spray. On this cart is mounted a barrel and a pump, the latter being connected with a length of pipe running along the back of the cart and parallel to the axles. To this horizontal pipe are attached three trees and short nipples, to which are attached the nozzles. By driving across the field in the direction of the rows a rather broad strip of plants can be sprayed as rapidly as it takes a horse to slowly pace the ground."

The above remedy or preventive is given as the best that has yet been devised to stay the progress of this rust. Its use has not proven entirely successful, reducing the damage on an average only about 25 per cent.

The following reports on the distribution of the asparagus rust are taken from a New Jersey Agricultural Experiment Station bulletin for 1901:

Professor Jones's report for Vermont is "that there has been less of the asparagus rust in this State than there was two years ago."

For Massachusetts, Professor Stone writes: "The rust has been prominent here this season, and there has been a slight tendency to its spread."

From Delaware, Professor Chester sends the following: "During the past two years it has not been as general and destructive as in the two preceding years, but all in all it is general throughout the State."

Professor Newton reports from Maryland that in some places the rust is abundant.

Professor Buckhout writes from Pennsylvania that "the asparagus rust is scarce this year—much less than before."

Professor Price, of Texas, writes: "I have found the rust in Texas for the first time this year."

Professor Selby, of Ohio, writes: "There appears to be no spreading of the rust."

Professor Wheeler, of Michigan, sends word that "the rust, so far as I can learn, is not on the increase."

Professor Goff, of Wisconsin, writes: "A single case of asparagus rust has been reported to me this season."

Professor Arthur, of Indiana, reports the rust as abundant as last season, and adds: "The infection of this region in general this year came largely or wholly from spores blown from considerable distances."

Professor Burrell reports for Illinois that "the disease has been spreading and is now known in at least a dozen plantations throughout the State."

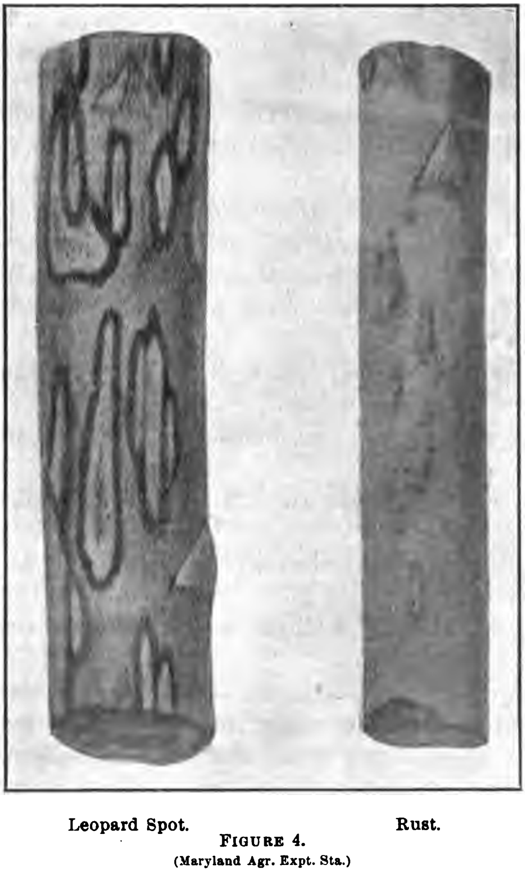
From Iowa, Professor Pammel writes: "I think the rust is on the increase, at least in this vicinity."

The Nebraska Experiment Station reports as follows: "From observations made near Lincoln, and from the reports that come in, there seems to be much less asparagus rust than last year at this time. Much of the brush that grew in the early part of the season was badly rusted, but the continued dry and hot weather of the summer helped to check it on a few small patches that showed rust."

Professor Saunders, of South Dakota, says: "I can not find that it is spreading. It was observed lately infecting a field near Yankton."

From Professor Bolley, of North Dakota, it is learned "that the disease did not make much headway upon the garden plot of asparagus until this last summer, when the attack was general and very destructive. The crop began to yellow in August, and by the last week in August, when it should have been very green, it was strictly brown and dried up."

From the foregoing it will be seen how wide is the distribution of the asparagus rust, and that the attempts to exterminate or prevent its spread have proven futile.



Leopard Spot. Rust.

FIGURE 4.

(Maryland Agr. Expt. Sta.)

Another fungous disease of the asparagus, which must not be confounded with the asparagus rust, has made its appearance in portions of the Atlantic seaboard. The accompanying illustration shows the difference in appearance. It is called the *Leopard spot*. Bulletin No. 50, of the Maryland Agricultural Experiment Station, gives the following description of the fungus:

"I have observed another fungus in the asparagus fields in Dorchester, Caroline, and Kent counties, that is equally as destructive as the rust. It belongs to the group of Anthracnoses, and is a new species. As yet it has not received a scientific name, but Dr. B. D. Halsted, of the New Jersey Experiment Station, who is working on this group, informs me that 'a description has been prepared, and after some further observation will be published.'

"Some asparagus-growers of this State have mistaken this disease for the work of the asparagus beetles. In general appearance the disease is very striking, the characteristic spots resembling the coat of a leopard, as shown in the left-hand figure of the illustration. I have therefore proposed to call it the 'asparagus leopard spot,' to distinguish it readily from the asparagus rust. By a little close observation this disease need not be confounded with injury by insects."

The asparagus rust appears in two or more stages, but it is the uredo or summer stage which causes the damage. The fall stage of the rust, known as the black or teleuto stage, causes no appreciable damage.

The Hatch (Massachusetts) Agricultural Experiment Station has thoroughly investigated the rust in that State, and has arrived at the following conclusions:

"The injurious effect of the rust has been confined to the dry, sandy soils possessing little capacity for holding water. Where the soil is heavier, possessing more water-retaining qualities, the rust has caused no perceptible harm.

"The injurious effect of the rust is apparent only when the summer stage occurs, viz.: the red spores, or uredo spores, which develop during July and August.

"The fall stage of the rust, known as the black or teleuto, has been prevalent all over Massachusetts since 1896, but this form has caused no appreciable damage and is disappearing.

"The practice of burning the tops in the summer has resulted in injury, and no benefit has manifested itself from burning in the fall.

"The results obtained by spraying asparagus are not encouraging.

"The various asparagus-beds on moist soils do not appear to be affected with the summer stage of the rust and consequently are not injured, being able, as it were, to resist the summer stage, although the tops of the plants are affected with the fall stage during their period of natural death.

"The best means of controlling the rust is by thorough cultivation in order to secure vigorous plants; and in seasons of dryness, plants growing on very dry soil with little water-retaining properties should, if possible, receive irrigation."

The same Experiment Station, in a bulletin issued in January, 1902, gives the status of asparagus rust in Massachusetts, as follows:

"In July and August outbreaks of the uredo stage were perhaps not so severe as a whole as in some years; nevertheless, it was severe enough to be likely to cause damage to the crop next year. The distribution of the rust in this State remains nearly the same as it has for some years, although there has been a slight tendency for the uredo stage to show itself in some beds which heretofore have never presented anything but the teleuto spore stage. * * * The young beds rust so much earlier than the old ones that they suffer more severely as a consequence, and in many cases are so weakened that it looks questionable whether they will ever develop into anything of value. * * * The teleuto spore stage appears to be widely distributed in this State, and has been from the very first. The question naturally arises, why do these teleuto-spore-infected beds not have a summer stage. * * * The principal and most important difference found in those beds which are subject to the summer and fall infection is one of soil texture and water-retaining capacity, which enable the plants, other conditions being equal, to remain vigorous during seasons of drought. When the asparagus rust first made its appearance there could be seen beds in which one portion was infected while the other showed not the slightest trace of disease. The only differences existing in the plants were their age and treatment. The differences of infection in their cases were due to different degrees of vigor. But such beds, being in regions where the soil is very sandy, subsequently became rusted."

The State Board of Horticulture of California, appreciating the impending danger to the asparagus industry of this State should the rust be introduced, passed a most stringent resolution, forbidding the importation of any asparagus roots and seeds from any quarter outside of the State, and the widest publicity was given to it. It is the only means by which the asparagus industry can be preserved in this State, and it is hoped that a willing compliance will be given to this resolution.

The rapid spreading of the asparagus rust since its introduction in 1896, and its wide distribution over so large an area, together with the impossibility (up to date) of exterminating it or even controlling it within reasonable bounds, prove it to be one of the most formidable pests that has ever threatened a single agricultural interest, and it is to be hoped that the measures taken by this Board to prevent its introduction into this State, supplemented by the efforts of our numerous Quarantine Guardians, will prevent its gaining a foothold here.

INSECTS OF THE YEAR.

A Review of the More Common Insects which
have been Reported to the State Board
of Horticulture During the Seasons
of 1901-1902.

SOUTH AFRICAN BLACK-SCALE PARASITE.

(*Scutellista cyanea.*)

By ALEXANDER CRAW.

This interesting, curiously-shaped, chalcid fly was first described from Ceylon, where it was found on *Lecanium coffeæ.* It was later found in Italy attacking wax scales (*Ceroplastis rusci*). Through Dr. L. O. Howard's efforts it was introduced into Florida and Louisiana in 1898, to try it upon the wax scales of those States. I have no report from Florida, but in a letter from Prof. H. A. Morgan, Baton Rouge, La., dated February 6, 1902, he writes: "Several years ago I tried to introduce *Scutellista cyanea* here to work upon *Ceroplastis cirripediformis,* but got no results. I am anxious to try it again, and if your colony has increased sufficiently, can you not spare me a few?" As we have so much territory in California where the parasite is required, I have not yet sent Professor Morgan a colony, but will do so in the spring.

It was not until Professor Charles P. Lounsbury, Government Entomologist of Cape Colony, called attention to the *Scutellista cyanea* as an efficient enemy of the "black scale" (*Lecanium oleæ*) in that country, that its true value was recognized.

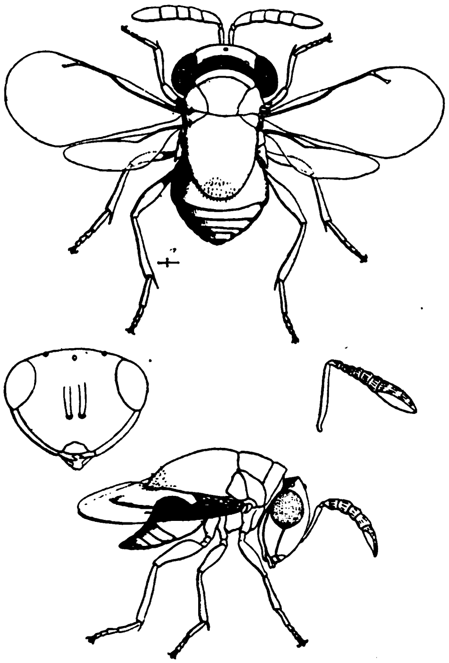
Through the efforts of the Hon. S. F. Leib, of San José, and Mr. E. M. Ehrhorn, of Mountain View, Senator Perkins appealed to the U. S. Department of Agriculture to use its good offices toward securing this valuable insect. Several colonies were forwarded to Mr. Ehrhorn, but unfortunately without any practical results from either sending. On October 1, 1901, Professor Lounsbury wrote me: "By to-morrow's boat we start to you two boxes containing cuttings of oleander bearing parasitized scale. It is not ideal material by any means and this is not the season we most wish to send in, but the scale and its parasites are both so scarce that we must send what we find as soon as we find it. Most of the scale in your vicinity will be old by the time this reaches you, but I am in hopes you may be able to get material from the south of the State that will take a generation of the parasite. Owing to the probable presence of secondary parasites, it is, of course, inadvisable to send the original material to any orchardist down there."

From this sending seventeen perfect insects developed, of which four were females. When placed in a breeding-case a small spider that was hidden in a rolled-up leaf, seized and killed one of the females, leaving us but three from which to colonize the State.

On December 26, 1901, I examined a full-grown black scale from the tree in the breeding-case, and found a small maggot of the *Scutellista cyanea*, about twice the size of a black-scale egg. This convinced me that they were breeding, so no further examination was made. On February 7, 1902, the parasites began to issue from the scales. During the warm summer months we find that the *Scutellista* passes through all its metamorphoses in forty-seven days.

Colonies have been sent to all the counties of the State where the black scale is troublesome. From personal examination and from material sent in, it is evident that the parasites have obtained a good start, and the coming season will, we hope, see them thoroughly disseminated.

Description.—In the female the antennæ are reddish-brown, with the ring joints and tips dark and more spreading than in the male. The antennæ of the male are black from the ring joints to and including the clubs, with the scape reddish-brown; the legs in both sexes are black, tarsi reddish-brown and claws black; the scutellum in both male and female is very large.



SCUTELLISTA CYANEA.

Imported South African internal parasite of the black scale—greatly enlarged. (After Howard.)

(With permission of U. S. Department of Agriculture.)

As the flies are small and very active it is difficult to detect them upon the tree upon which they may be placed, and the best way to determine if they are established is to remove and examine the inside of the full-grown scales about forty to fifty-five days after liberating the parasites. The larva is maggot-shaped and white, this soon changing to the pupa, which is black just before changing to the perfect fly.

THE CALIFORNIA PEACH-ROOT BORER.

(*Sanninoidea opalescens.*)

BY EDW. M. EHRHORN,
Entomologist of Santa Clara County, California.

California has had its share of insect pests as well as other States of the Union; but, fortunately for the grower, these pests, after doing considerable damage, have been eradicated or kept in check by various laborious means and, more recently, by predaceous and parasitic enemies. The grower, however, can never expect to be unhampered by these pests, for no sooner does one disappear for a season or two, than either it will return or another pest will take its place. We have found this to be the case with scale insects, and also find it to be the case with caterpillars, the various larvæ of our butterflies and moths.

The most serious pest of the orchards of some sections to-day is, without question, the peach-root borer (*Sanninoidea opalescens*). I should say California peach-root borer, to distinguish it from the Eastern species (*S. exitiosa*), a very closely allied species, which does considerable damage to peach orchards, and the habits of which are similar to those of our insect.

Our peach-root borer has been known for over fifteen years, but no experiments have ever been systematically carried on to effect its destruction. In looking up the records, we find the first mention of the pest was made by the late W. G. Klee in the year 1888, in the report of the State Board of Horticulture, 1887–1888, at which time he was Inspector of Fruit Pests for the State. He says: "My first information of this pest came from Mr. John Britton, Quarantine Guardian for Santa Clara County, who sent me, under date of May 22d, chrysalids and larvæ and a mutilated specimen of a female, mentioning in his letter that this borer had killed a number of trees and that a number of orchards were affected. In his company I visited, some days later, the locality, a couple of miles southeast of San José, and satisfied myself about the dangerous character of this insect." Continuing further on, he says: "Whence the insect came I can only conjecture, but the supposition is, that it is a native insect that has existed on some wild bush and gradually has taken to the peach trees in the neighborhood, according to the statement of Mr. Leigh, whose orchard has suffered for many years." Thus we see that the insect had existed as an orchard pest for a number of years before it was made known to the public, possibly spreading unobserved, instead of being eradicated at the start.

The various stages of the peach-root borer are not generally known to the grower. Only the borer or larva and the pupa have been noticed; very few being familiar with the adult insect, male and female, and the egg.

The following description of the different stages of the insect will aid those who are troubled with this pest, in detecting it:

Egg.—The egg is very minute, not exceeding ¼ mm. in length, oval, light brown in color, and, when seen through a lens, ornamented with hexagonal sculpturing. The eggs are deposited on the bark of the tree, at or near the surface of the ground; rarely they are laid high up on the trunk or even in the crotches of the tree. This last phase is generally found in the grafted trees, where gummy exudations have occurred and where grafting has somewhat soured the sap.

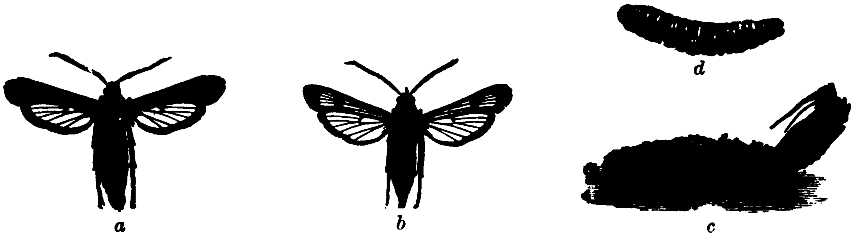


FIG. 1. PEACH-ROOT BORER. (*a*) Female. (*b*) Male. (*c*) Pupa. (*d*) Larva.

Larva.—The young larvæ, on hatching, are very active and immediately burrow into the tree, generally entering the cracks in the bark at or below the surface of the ground. Here they remain, constantly feeding on the bark, at first near the surface, surrounding themselves with gum, or coagulated sap, and gradually enter the sapwood, enlarging their burrows as they increase in size. The full-grown larva (Fig. 1, *d*) is pale yellow, about one inch long, tapering, with a brown head. After attaining its growth, the borer ascends in the burrow to or above the surface of the ground, as the case may be, and begins to spin a cocoon.

The Cocoon.—This is made up of a silken web mixed with castings and earth glued together, and is of a brown color, from 1¼ to 1½ inches long. (Fig. 1, *c.*)

Pupa.—The pupa within the cocoon is shiny, light brown, with numerous spines on the abdomen. When about to emerge the pupa is pushed out of the cocoon, as in Fig. 1, *c*, and soon the adult moth emerges.

The Moth.—To the novice this insect would appear more like a blue wasp than a moth. The female (Fig. 1, *a*) differs so much from the male (Fig. 1, *b*) that they might be taken for two distinct species. The female has bluish-black, opaque front wings, while the hind wings are transparent, like those of a wasp; the margin of both wings has a bluish-black fringe; antennæ, head, thorax, and abdomen are very dark steel blue, almost black; wing expanse, 1½ inches. The male (Fig. 1, *b*) has forewings nearly transparent, with upper margin and tips black; hind wings are transparent, like those of female; the body is bluish-black; the abdomen is much narrower than that of female and more elongated; legs are black, with yellow tufts on femur and tibia; wing expanse, 1¼ inches.

This insect differs very much in looks from the Eastern peach-root borer, which, as far as my observations go and according to Dr. L. O. Howard, of the U. S. Department of Agriculture (Bulletin 176, Cornell University Agricultural Experiment Station), does not exist on this Coast.

On several occasions imported trees from the Eastern States have been found infested with the larvæ of *S. exitiosa*, but through careful inspection and destruction these were not distributed; nevertheless, we should be on our guard. The female differs from the Californian in having a broad orange band in the middle of the abdomen and is a more slender insect. The larvæ of the two species are very hard to distinguish from each other, but the habit of the California species, which makes almost vertical burrows, while the Eastern species girdles the tree, might be used as a guide.

The food plants of the California peach-root borer, when first discovered, were the peach and cherry root. In the report of the State Board of Horticulture of the tenth Fruit-Growers' Convention, I find, in an essay by Mr. Klee, the following remarks. After he tells of his first notice of the pest near San José, he says: "If plum root is or is not attacked, we have not been able to prove conclusively, as we saw very few trees on plum root in the immediate neighborhood; but there is a strong probability that both plum and apricot are resistant. This matter requires thorough investigation, and I intend to try the experiment of colonizing the borer on plum root."

I can not find any record of Mr. Klee's experiment, but I can say, and all who have dealt with the borer know, that it will attack peach, almond, apricot, cherry, and plum roots, although the plum root (Myrobalan) is not so badly attacked as the others.

In regard to the development of the insect, from the egg to the adult, we are as yet somewhat in the dark. The Eastern species requires one year to complete its life circle. I believe the California species does the same, but our climatic conditions and the variety of food have caused the insect to have several broods. The moth in Santa Clara County has been observed flying at intervals from April to the end of October, which indicates that the species in this State has probably three or four broods. To still further prove this, I have found in one tree three distinct sizes of larvæ, viz.: newly hatched, half grown, and full grown. It is this fact that causes many failures in subduing the pest, as I will explain later on.

Mr. Klee reported the moth as appearing in May and June. This year (1902) I collected cocoons about the first of April, from which the moths emerged about April 15th. We find full-grown larvæ in some sections of the country and newly-hatched or half-grown larvæ in other sections, at the same time of the year. Here another danger lies, for if trees from these two places should be exchanged, by nursery stock being sold from one to the other, we will readily see why, in some sections, we find different broods present.

This pest spreads in various ways, but probably the most common method is in the transportation of infested nursery stock. It behooves the grower to be very particular in this respect, and those who are planting peach, plum, prune, apricot, almond, or cherry trees, should examine all trees carefully before planting, for if once the pest gets a foothold in a new locality it will soon spread, at first very slowly, but fast enough to cause great expense and much annoyance. This spreading is done by the female, which is very active and flies readily and swiftly, but does not fly a very long distance.

The Peach-root Borer's Life.—As stated above, very few have taken the pains to study the peach-root borer, and know it only as a borer—the larva of the insect—and have sometimes found the cocoon, which is the dormant state of the insect. They have not seen the egg, and least of all the moth, the cause of the whole trouble. This insect, like most other insects, begins life as an egg. These eggs the female lays probably in a few hours after copulation, and they are laid singly and in groups, in all sorts of places, at or near the surface of the ground on the bark of the tree. A female moth may lay from two hundred to five hundred eggs, but fortunately not all hatch, many perishing through some cause or other. In the Eastern States it is claimed that the young larva hatches in from eight to ten days after egg-laying. In California this has not yet been observed, but probably it takes about the same time, although I believe that climatic conditions have a great deal to do with the length of time.

The young borer begins feeding from the outside bark, generally starting in minute cracks, and gradually works its way to the sapwood, where it increases in growth and makes its burrow. Here it remains for from ten to eleven months, doing great damage to the bark, and when numerous larvæ are present, often causing the death of the tree. Large quantities of gum collect on the bark about the burrows, and this is a sure indication that the pest is present. During the cold winter months the larvæ do not grow much, but as soon as the sap begins to flow, they grow rapidly and soon attain their mature state. They then begin to ascend in the burrow and get near or above the surface line and spin the cocoon, which is still hidden in the burrow or under a piece of dead, loose bark. Before the larva makes a cocoon it bores an exit in the bark, near which it starts to spin. Soon the larva turns to a pupa within the cocoon, and, depending on climatic conditions, remains dormant for from ten days to four weeks. When the pupa is mature, it moves itself, by aid of the spines on the abdomen, out of the cocoon enough to project half its length (Fig. 1, *c*) so as to allow the moth, which is very delicate, to emerge without difficulty. The moth soon bursts through the pupa skin, which splits down the center of the back for a short distance. After carefully drawing out its legs and by aid of these its body, it may crawl a short distance and rest until its wings expand and dry. It is then ready to fly off and find its mate. After mating, the female soon lays the eggs, as stated above, and its life circle is completed. It is very easy to tell whether or not the moth of the peach-root borer has hatched in the orchard by the empty projecting pupa skins. (Fig. 2, *p*.)

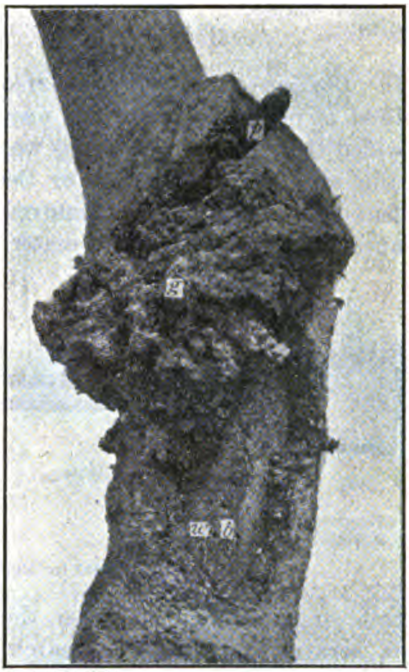


FIG. 2. Work of a single borer in a peach tree; natural size; (*w b*) burrow of borer; (*g*) gummy mass; (*p*) pupa projecting from cocoon. (After Slingerland.)

METHODS OF DESTROYING THE PEST.

As I have stated before, the peach-root borer has been known for over fifteen years in this State, and for fifteen long years the grower has fought it in every conceivable way. Many different remedies have been used and recommended, and still the pest is with us, as numerous as ever and attacking more varieties of roots now than when first recorded.

As the larva or borer (Fig. 1, *d*) presents the most vulnerable stage of the insect's life, the most successful attack is made at this stage. The methods for fighting it are twofold, viz.: preventive and destructive. In discussing these methods it will be well for us to begin with the latter. The destructive measures used against the borer are either the tedious way of digging it out with a knife or chisel or with an especially made instrument (Fig. 3), or by the use of strong washes applied to the trunk and roots below ground, or by the fumes of carbon bisulphide.

In looking over the various remedies which have been used since the insect became known, I find the following which have given good results:

The Digging-out or Worming Method.—The digging-out or worming method is no doubt the surest way to know that the borers are killed, provided that good conscientious workers can be had. The best time to do the work is in November or December. The soil, which should be moist enough to crumble, is removed from around the tree and the bark scraped free from all clinging materials, such as gum and earth. With a knife or chisel, or, still better, the regular tool (Fig. 3), composed of hook, scraper, and chisel, the search for the borer is made. First find a channel and follow it up or down, using the hook, and locate the borer. Make a thorough search for every one until you are satisfied that all borers are out of the tree. Care should be exercised not to take too much bark off—only the necessary quantity to get the borers out. The trees may be left open for a few days, especially if moist weather prevails, and then can be covered up until spring, when some preventive may be used, as shown later on. Some growers have dug for borers twice a year, generally in May or June, with good results. Shallow-rooted trees are attacked more severely than trees planted deep; and trees with root-knot are also favorite places for the borer to thrive.

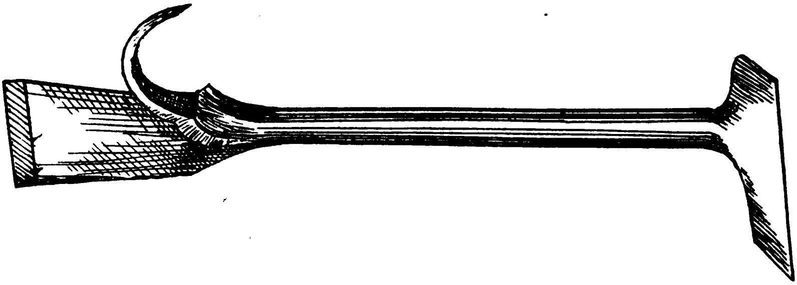


FIG. 3. Instrument for digging out peach-root borers.

Carbon Bisulphide.—To get the best and quickest results from the carbon bisulphide fumes, the soil surrounding the tree should be as loose as possible. To accomplish this, remove the soil from the base of the tree as shown in diagram (Fig. 4, D). It should be from six to eight inches from the bark to the edge of the trench, and as deep as there are indications of the borer; the gummy masses and castings indicate the location of the borer (Fig. 4, A and B). Then this trench should be filled up to the level with some mellow soil from the surface of the ground, as is shown in diagram (Fig. 5, E). Now we are ready to put the carbon bisulphide around the tree; from one and one half to two and one half ounces are used according to size of tree. It is safest not to put the liquid on the bark, but about one and a half or two inches from it, as indicated in Fig. 6, at F. After the liquid has been put around the tree as directed, it should be immediately covered with six or eight inches of pulverized soil and pressed down with a shovel, as indicated in Fig. 6, G. If these directions are followed there is no reason for failing to kill the borer. Experience has taught us that the fumes will remain about the tree for from a few days to a couple of weeks, and if rain should fall after the application, some damage may result. We therefore recommend the removal of the soil from the trench, after a few days; or if rain should follow the application, the soil should be removed at once. A few years ago, in 1896, when this remedy was first introduced by Mr. Cragin, people were too anxious to try it, and, in the endeavor to do a good job, overlooked some important points; the result was some damage to a number of trees. Since that time, however, some of our more careful and experienced orchardists have tried the liquid and would not use anything else now. This remedy, applied in November or December and followed with the lime, coal tar, and whale-oil soap wash, as a barrier, will reduce this terrible pest.

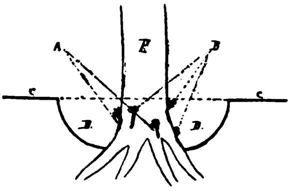


FIG. 4.

P. Peach tree.
A. Burrows of borers exposed.
B. Gum and castings.
C. Surface of soil.
D. Trench.

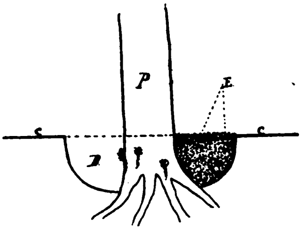


FIG. 5.

E. Mellow earth filled in trench.

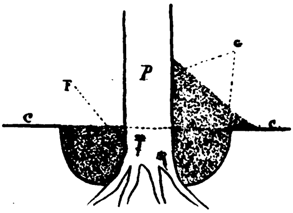


FIG. 6.

F. Location to put carbon bisulphide.
G. Soil covering carbon bisulphide after application.

Strong Washes.—Some caustic soap washes have been tried against the borers without first digging them out. Although in some cases such treatment has worked well, mostly where young larvæ exist, yet for the old larvæ it will not give results which would warrant the cost of the wash and the labor. In the Eastern States coal tar or gas tar is used in this way, and from reports received, good results have been obtained, even with nearly full-grown borers. In California we have always been warned against the use of this material, owing to our dry, hot climate, yet some very good results have been obtained when the tar was kept below the ground. We have had damage where the tar was put on the body of the tree, even only a few inches above the ground, still sufficiently exposed to the hot weather to drive the oils into the bark and wood so as to kill portions of the tree.

Tobacco.—During the spring of 1902 I applied some tobacco dust to a few badly infested trees, and on examining them this fall I found but two borers in six trees treated. I found that the bark and earth touching the bark had been saturated with the liquid tobacco. I shall try further experiments next spring and hope for better results. I used about half a pound to the tree, and this was covered over so as to prevent the wind from blowing it away. In the Eastern States tobacco was used by binding tobacco stems (the midrib of the tobacco leaf) around the trunk and then covering with earth. Some good results were obtained, and it is thought that the liquid, which the moisture brings out of the stems, did the killing. Tobacco dust and stems can be had at any of our cigar factories; stems sell for one cent a pound and less, tobacco dust for two cents a pound.

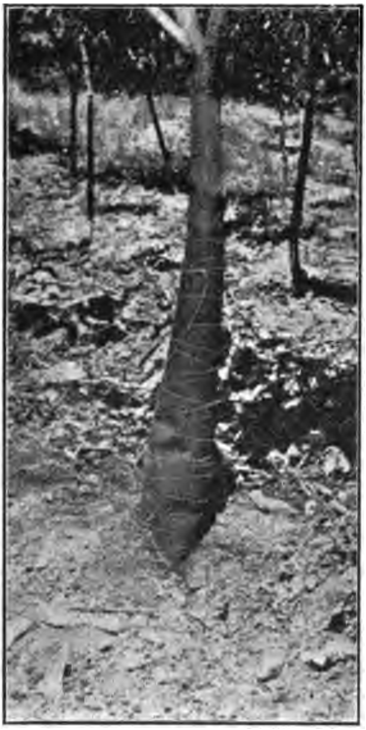


FIG. 7. Peach tree treated with tarred paper. (After Slingerland.)

Gas Lime.—Some years ago it was thought that gas lime would be a good remedy and would likely kill the borer in the burrow. Experiments were tried, with fatal results to the tree. I mention this, as on several occasions inquiries as to this material have been received.

PREVENTIVE MEASURES.

Preventive measures or barriers are substances which prevent the young larvæ from entering the tree, and it has been the endeavor of the experimenter to find some substance which would be least affected by rain and which would yield as much as possible to the expansion of the trunk of the tree.

Paper.—Good paper has lasted better than many other barriers, and very successful results have been obtained. We have, however, had also great failures, and these can be attributed to the fact that the small borers—those that are just beginning to enter the bark—were not taken out of the tree. As I have stated above, these small borers are very often overlooked, and if inclosed under any paper barrier will continue feeding and doing damage, which will be discovered when the paper is removed in the fall. Some failure may be attributed to weather conditions (rain and wind), which soften the paper and cause it to become torn in places, allowing the borer to enter unobserved. If paper is to be used, good stout paraffine paper is the best. Enough soil should be removed from around the tree so that the paper can be put at least six inches below the surface; it should also be placed at least eighteen inches up on the trunk. The paper should be tied with cotton string in several places, to hold it tightly around the tree; and it should be either folded upon its edges or given a broad lap (Fig. 7). These barriers should be put on about the middle of March, and this may be said of all preventives or barriers; the object being to have the tree protected before the moths fly.

Lime, Coal Tar, and Whale-oil Soap.—Probably the best preventive used to-day is a compound of the following ingredients:

Unslaked lime	50 pounds.
Coal tar	1½ gallons.
Whale-oil soap	12 pounds.

To make the compound, slake the lime and tar together, adding enough water to make a moderately thick whitewash. Dissolve the soap with *hot* water and add this to the lime solution, adding enough water to make a thick, paste-like whitewash. For economy, some fine sandy soil may be added to make quantity, but not too much, otherwise the compound will become too brittle when dry, and will lose its purpose. Paris green and sulphur have been added to the above compound, but experience has shown that no results have been brought about by this addition, so that the money spent is only wasted.

I may mention here that the mounding process—the piling of earth around the tree—has been tried here, but owing to the different habits of our species, it does not work as well here as it does in the Eastern States. All preventives should be used with the destructive methods and applied as directed above. Trees must be treated every year as long as this pest appears in a locality, otherwise it will never be kept in reasonable check so as to give the grower peace.

During the period 1888–1902 the following articles have been published in the more important reports, bulletins, and agricultural papers:

1888. W. G. Klee. A treatise on the insects injurious to the fruit and fruit trees of the State of California.

1888. Biennial Report of the State Board of Horticulture. Report of W. G. Klee, State Inspector of Fruit Pests.

1889. Essay by W. G. Klee. Official report of the Tenth Fruit-Growers' Convention.

1889–90. Biennial Report of the State Board of Horticulture. Insect Pests.

1891. D. W. Coquillett and C. V. Riley. Insect Life, Vol. III, p. 292. Discussion.

1891. A. Craw. Bulletin 58, California State Board of Horticulture. Peach-tree borers infesting deciduous trees.

1894. A. Craw. Bulletin 68, California State Board of Horticulture. Insect pests and remedies.

1895–96. A. Craw. Biennial Report of the State Board of Horticulture. Remedies and preventives.

1898. E. M. Ehrhorn. Pacific Rural Press. The crown-borer of the peach.

1899. E. M. Ehrhorn. The Twenty-fourth State Fruit-Growers' Convention. Discussion on peach-borers.

1900. A. Craw. Bulletin 71, California State Board of Horticulture. Insect pests and remedies.

1898–1901. Carroll Fowler. Report of Agricultural Experiment Station, University of California. The peach-tree borer.

INSECTS AS DISTRIBUTERS OF HUMAN DISEASES.

For centuries it has been observed that where the ground was low and marshy, interspersed with stagnant pools of water, the people living in such localities were more subject to malarial diseases than were those living in higher and drier places. In such marshy places mosquitoes were also abundant, and it was the consensus of opinion that the exhalations from the marshes caused disease. The mosquitoes were only deemed an incident, but recent scientific investigation and experiment have proved beyond the shadow of a doubt that were the mosquitoes eliminated there would be no malarial disease. That a person may live in malarial places and enjoy perfect immunity from intermittent fevers, if he stays in doors at night, protected from swamp emanations only by wire gauze on open doors and windows, has been proven by repeated experiments.

The attacks of mosquitoes cause almost intolerable suffering and annoyance to man and beast in some places. It is stated that when the mosquito inserts his proboscis into a warm-blooded animal it also at the same time injects a poison that sets up a local inflammation, which causes the blood to flow to that place, thus enabling the mosquito easily to obtain a supply of blood and which afterward causes the painful and disfiguring blotches on the person attacked.

It was not until 1882 that the idea that mosquitoes conveyed the malarial germ and deposited it in the human blood was promulgated. In 1900 an Italian, Grassi, proved by experiments that if persons were protected from the bites of certain mosquitoes they would not be afflicted with malaria. Afterward two English physicians, Sambon and Low, in the autumn of 1900 lived in a home in the most malarial portion of the Compagna. The house was thorougly screened from mosquitoes. During their entire stay they were free from malaria and chills, while the people living in unprotected houses were suffering from chills and fever. At the same time an Anopheles mosquito that had bitten a malarial patient was sent to England and allowed to bite a person who probably never had malaria, at least not since childhood, and in course of time he developed a typical case of malaria.

It has been determined that the germ causing malaria passes certain phases of its life history in a particular kind of mosquito, and certain other phases of its development in the blood of the human body. After passing through these stages in the mosquito it is injected by that insect into the human blood, there to pass other stages of its development by which malaria is produced.

In an experiment conducted in one of the Southern States a building of one large room was constructed in a notoriously malarial swamp. The room was equally divided in the middle by mosquito netting, and in half of the room, protected from mosquitoes, were placed six men. In the other half of the room, which was unprotected, were placed six men. All had previously been examined by a physician and found in perfect health. In the course of time, five of the six men in the unprotected part of the room were affected with malaria, while the six men in the part of the room protected from mosquitoes remained healthy.

The relation of mosquitoes to yellow fever has been shown by the following experiment made in Cuba by a medical commission from the United States Army, and published in Bulletin No. 74 of the Mississippi Agricultural Experiment Station:

"In a field near Quemados, Cuba, the commission of surgeons erected a small wooden building, tightly ceiled and with the windows and doors closely screened so that no mosquitoes could enter. In this house during a total of sixty-three days seven non-immune men were kept. They used the unwashed pillow slips, sheets, and blankets that had previously been used on the beds of genuine yellow fever patients in Havana and elsewhere. Neither during that time nor subsequently did one of these seven men develop a case of yellow fever.

"Another house was built in this same field and divided by wire screen from floor to ceiling into two rooms. The doors and windows were closely screened with fine wire netting so that no mosquitoes could enter. All bedding and material carried in was disinfected by steam. In one of these rooms mosquitoes of a certain kind that had previously bitten patients with yellow fever were placed. In the other room none were allowed. Non-immunes were placed in both rooms. Of those in the room containing no mosquitoes, none had yellow fever. Six out of seven of those in the other room that were bitten by mosquitoes developed cases of genuine yellow fever. This would seem to indicate almost conclusively that mosquitoes of a certain kind are responsible for the transmission of yellow fever from one individual to another."

As further proving that yellow fever can be conveyed by mosquitoes we take the following extracts from Bulletin No. 96 of the Kentucky Agricultural Experiment Station: "Upon the recommendation of Surgeon-General Sternberg, a medical board was appointed to study yellow fever in Cuba, consisting of Drs. Reed, Carroll, Agramente, and Lazear. Two members of the board, Drs. Lazear and Carroll, allowed themselves to be bitten by mosquitoes that had previously bitten yellow fever patients. Both became affected with the disease, the former losing his life."

Another experiment was as follows, which it would seem conclusively proves that the germs of yellow fever are conveyed alone by mosquitoes:

"The board had erected a frame house, such that mosquitoes could not enter, and styled it 'Building No. 1,' or the 'Infected Clothing and Bedding Building.' On November 30, 1900, this building was provided with bedding soiled by contact with yellow fever patients at the Los Animos Hospital, Havana, Cuba, and at Columbia Barracks, some of it purposely and freely soiled, and in the evening after unpacking it and shaking it in the air of the room to liberate the germs of yellow fever should any be present, Dr. R. R. Cooke and two privates of the hospital corps, all non-immune Americans, made up their beds of this clothing and slept there and continued to do so thereafter until December 19, 1900, adding to their equipments, on December 12th, bedding so offensive that its odor compelled them to retreat for a time from the house. Though spending twenty nights in this house, all three remained in good health. Subsequently other non-immune Americans occupied this building, using even undershirts that had been worn by yellow fever patients, and in not a single instance was yellow fever contracted.

"In a second building, known as 'Building No. 2,' or the 'Infected Mosquito Building,' all articles used were carefully disinfected by steam, after which infected mosquitoes were introduced."

Comparing the results of the experiments made in the two houses, the board in the bulletin referred to reports:

"Nothing can be more striking and instructive as bearing on the cause of house infection in yellow fever than when we contrast the results obtained in our attempts to infect buildings Nos. 1 and 2; for, whereas, in the former *all* of seven non-immune men escaped the infection, although exposed to the most intimate contact with the formites (soiled clothing) for an average period of twenty-one nights each, in the latter an exposure reckoned by as many minutes was quite sufficient to give an attack of yellow fever to one out of two persons who entered the building, or fifty per cent."

While in California there is little danger from yellow fever, the above experiments are given to show that some diseases are carried by insects, and further research and experiment may show that many other epidemic diseases are distributed in the same manner.

The following is an article from the Yearbook of the U. S. Department of Agriculture, written by Entomologist L. O. Howard, Ph.D.:

"In very many parts of the country the farming population has to contend with at least two diseases which are preventable. These are malaria and typhoid fever. Both of these diseases are transferred, or may be transferred, by insects—malaria by certain mosquitoes, and typhoid fever by the common house fly, or certain other flies.

"While it is true that both malaria and typhoid prevail in large cities, it is none the less true that they may, with a certain degree of accuracy, be termed country diseases; that is to say, rather specifically, diseases of the farm and small village. Malaria, in fact, has been called by the medical men a country disease. Swampy regions do not occur in cities, or, at all events, only in the suburbs, whereas they occur commonly in the country. Open streams with side pools of still water are found only in the country, and it is in such still, small pools, and in more or less permanent but small accumulations of water, that the malarial mosquito breeds. This mosquito, therefore, does not accommodate itself well to city conditions, but is found almost everywhere in the country, except possibly in very dry localities and at certain high elevations. Even in dry regions it sometimes abounds, especially where there is a definite rainy season, or where the land is irrigated. Irrigating ditches are prolific breeding-places for mosquitoes, including the malarial kind. Malaria, in cities, as a rule, is found only with persons who have contracted it in the country or in the suburbs, although with some cities having marshy places on their borders a malarial belt may exist, the extent of which depends upon the direction and force of the prevailing summer breezes, especially the night breezes. For example, such a condition as this accounts for the prevalence of malaria in certain portions of the city of Washington before the reclamation of the Potomac flats, which lie to the south of the city, the prevailing night breezes of the summer being southern.

"Cities well supplied with water from a reservoir, especially with a filter reservoir, which possess a modern sewage system, and in which water-closets are universal, derive typhoid fever only from the following sources: Contaminated country milk, the return of the people in the autumn from the less sanitary country, and lack of care in the disposal of the discharges of persons who have contracted typhoid from either of the first two sources.

"In the country, however, conditions are different. Each country house or each house in a small village has its own water-supply, usually in the shape of a well; the cattle get water from the streams; there are no water-closets, and excreta are deposited in the open or in box privies; drainage from these box privies or the open deposits containing virulent typhoid germs may enter the streams, be carried for some distance, and be taken into the stomachs of cattle all along the course of the stream, or the germs may be carried by underground drainage directly into the wells from which drinking water is gained; or, exposed as these box privies or open deposits are, certain flies may light upon the excrement and carry the germs directly to the food-supply of the houses; or certain flies may breed in this excrement and fly, fairly reeking with disease-bearing filth, to the kitchens and tables of nearby houses. When we consider that active typhoid germs may be given out for some time by persons who have not developed typhoid fever sufficiently so that it may be recognized, and that they may also be given out for some time after patients have been apparently cured of the disease, it is perfectly obvious that in the country the lack of care with which excreta are deposited readily accounts for outbreaks of typhoid fever from any of the causes mentioned.

"Of course it will be said that the entire water-supply of a city may become contaminated at or immediately above its reservoir supply. This contamination is from country sources and might be obviated either in a general manner by the establishment of a reservoir filtering plant, or in a special manner by individual householders by the constant and thorough use of house filters. In cities possessing a common water-supply and modern sanitary plumbing there is no excuse for the presence of typhoid in the household. Even the city water must be filtered, which can be done by the use of any one of the cheap filters now in the market; the milk which is drunk by children must be sterilized, and the excreta of persons returning to the city, after contracting typhoid fever in the country, must be disinfected with the utmost care. These three measures, systematically followed, will result in the abolition of typhoid fever within the city boundaries. So much for cities. In the country the matter is somewhat more difficult, and immunity from malaria and typhoid depends largely upon the individual householder. Such immunity may be obtained, but only as a result of intelligent care.

"Let us briefly consider what the farmer or resident of a small village must do to bring about protection.

"The old idea that malaria is caused by breathing the miasma of swamps has been exploded. Malaria is contracted only through the bites of mosquitoes of the genus Anopheles. The cause of human malaria is the growth and development, within the red-blood cells, of a very minute parasitic organism belonging to the lowest group of the animal kingdom—the group Protozoa, or one-celled animals, which includes those minute creatures known as Amœbas and others, and which live in the water or in damp sand or moss, or inside the bodies of other animals as parasites. This parasite reproduces in the body by subdividing, eventually bursting the red-blood cells and entering the blood serum as a mass of spores. Broadly speaking, when the blood of a human being is sucked into the stomach of a mosquito of the genus Anopheles, the malarial parasite undergoes a sexual development and gives birth to a large number of minute, spindle-shaped cells, known as blasts, which enter the salivary glands of the insect and are ejected with the poison into the system of the next person bitten by the mosquito. If this person happens to be non-malarious the malaria has thus entered his system and malarial symptoms result. So far as present knowledge goes, this is the only way in which people become malarious. In order to avoid this result it is necessary to avoid the bites of malarial mosquitoes, and it therefore becomes important to know the differences between the malarial and the more harmless mosquitoes, and the conditions under which the malarial forms breed.

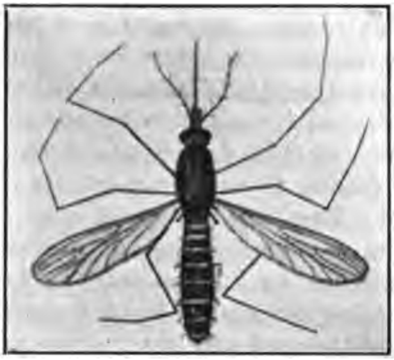


FIG. 1. Adult female of *Culex pipiens*; enlarged. (Miss. Agr. Expt. Sta.)

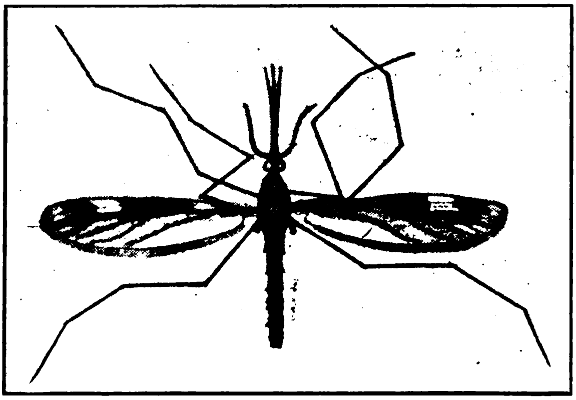


FIG. 2. Female of *Anopheles punctipennis*; enlarged. (Miss. Agr. Expt. Sta).

"There are very many mosquitoes which have not yet been proven to carry any disease. In fact, the majority of mosquitoes are supposed to be harmless except for the irritation caused by their punctures. The commonest of all forms belongs to the genus Culex. These include the mosquitoes most commonly breeding in rain-water barrels and chance transient pools. Culex, the harmless mosquito, has clear wings, while Anopheles, the malaria bearer, has wings which are more or less spotted. Further, while the palpi (which are projections on either side of the beak) are very short in Culex, they are long—nearly as long as the beak—in Anopheles; and, further, it has been observed that when Culex is resting upon a wall it appears more or less humpbacked, that is to say, the head and beak are not in the same plane with the body and wings, but project at an angle toward the surface of the wall, the body and wings being parallel with the wall. With Anopheles, however, the head and beak are in practically the same plane with the body, and the body itself is usually placed at an angle with the wall, and especially when resting upon a horizontal wall, such as the ceiling of the room, the body of the Anopheles is at a very great angle with the surface. We have in this country three species of the malarial genus Anopheles, namely, *Anopheles maculipennis*, *Anopheles punctipennis*, and *Anopheles crucians;* the two former are found nearly all over the country, but the last is a more Southern species, although it has been found as far north as the south shore of Long Island. As to the early stages, the eggs of Anopheles may at once be distinguished from the eggs of Culex, those of Culex being laid in a raft-shaped mass on end and those of Anopheles being laid singly upon the surface of the water, always lying upon their sides. The larvæ of Culex, commonly known as wigglers, are familiar to almost every one, and are the common wigglers found in horse-troughs and rain-water barrels, which wiggle around in the water, returning at intervals to the surface to breathe, and when at the surface hanging with simply the tip of the tail extruding, the rest of the body being held below the surface at a great angle. What we have called the 'tail' is simply the breathing tube, which, with the common Culex wigglers, is long and more or less pointed. With the malarial mosquitoes, however, the wiggler, or larva, is of somewhat different shape, and when resting at the surface, which it does most of the time, it lies with its body parallel with the surface, and not hanging down, as does the Culex wiggler.

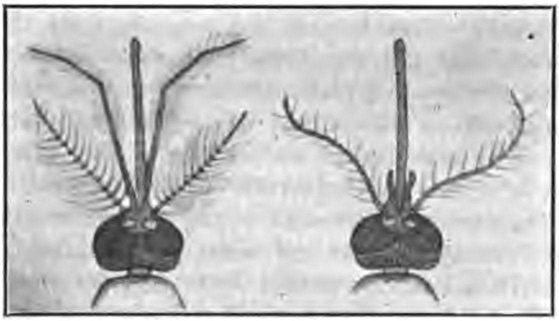


FIG. 3. At left, head of male Culex; at right, head of female Culex. (Miss. Agr. Expt. Sta.)

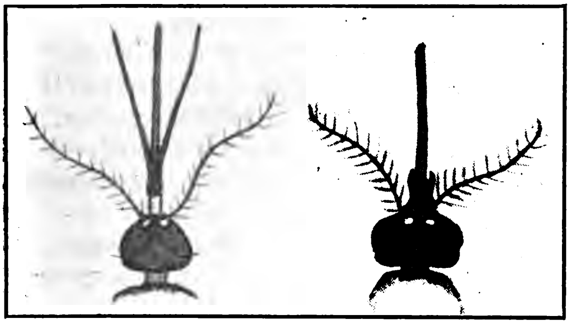


FIG. 4. At left, head of Anopheles, showing appendages; at right, head of Culex, showing appendages. (Miss. Agr. Expt. Sta.)

"The breeding-places of the harmless mosquitoes are more numerous and more varied than are the breeding-places of the malarial mosquitoes. Anopheles, however, are found under many divers conditions. They are found, as stated, in still side pools of small streams, in the swampy pools at the margins of larger ponds, in stagnant water in ditches, in the beds of old canals, in the still water at the sides of springs, and occasionally, though rarely, in old horse-troughs. They are perhaps more frequently found in such situations as described when a certain amount of green scum has accumulated, and it is upon the spores of the water plants constituting this green scum, as well as upon other very small objects floating on the surface of the water, that they principally feed.

"To prevent malarial mosquitoes from breeding in a given vicinity, one should be prepared to recognize their larvæ when they are seen, and to distinguish them from other mosquito larvæ; then a most thorough search for all possible breeding-places should be made within a radius of a mile. This distance is mentioned, since it seems rather definitely proven that the Anopheles mosquitoes do not fly for great distances. After the breeding-places are found they should be drained or filled in with earth, or they should be rendered uninhabitable to the Anopheles larvæ by covering the surface of the water with a thin film of kerosene oil, or by introducing certain fish which feed upon the larvæ, such as top minnows, sticklebacks, young sunfish, or goldfish.

"Pending the result of such exterminating measures, all houses in malarious localities should be carefully screened to prevent the entrance of mosquitoes. After screening, thorough search should be made in the house for mosquitoes which have already gained entrance. Such as are found roosting upon the walls should be captured by placing an inverted vial over them, or they may be stupefied by burning a small amount of pyrethrum powder upon a tin dish cover. Persons wishing to avoid malaria should not sit out of doors at night exposed to the bites of mosquitoes. Persons having malaria should be carefully screened at night to prevent them from being bitten by mosquitoes, which, becoming thus infected, would become potential carriers of the disease. Such patients, systematically treated with quinine, the dose being always given at the beginning of the chill, will soon be rid of the disease. The time of the dose is important, and the reasons for the time have been abundantly proven by the study of the life of the parasite in the blood cells.

"All of this advice is given only after abundant demonstration of the efficacy of the methods. These efforts have been followed with success in the most malarious districts in the world, and with this knowledge there is no good reason why any individual should contract malaria in his own home, no matter how much malaria exists around him.

"Of course, however, there may be occasions where it is almost impossible to avoid contracting the disease. For example, last October, the writer was waiting for a night train one evening in a small Western town where there were irrigating ditches near the station. In these ditches malarial mosquitoes were breeding profusely and the insects abounded in the station waiting-room and on the platform. Nothing but a gauze covering would have kept them away, and several bites were inflicted on the hands and neck. Fortunately, none of the individuals could have bitten a malarial patient, as the disease was not transmitted.

"It is not the writer's intention to go further into the causation of typhoid fever than he has already done in his introductory remarks. He wishes, however, to point out as forcibly as possible the danger of its spread by insects and the methods of avoiding this danger.

"The principal insect agent in this spread is the common house fly, and this insect is especially abundant in country houses in the vicinity of stables in which horses are kept. The reason for this is that the preferred food of the larvæ of the house fly is horse manure. House flies breed in incredible numbers in a manure pile largely derived from horses. Twelve hundred house flies, and perhaps more, will issue from a pound of horse manure. Ten days completes a generation of house flies in the summer. The number of eggs laid by each female fly averages about one hundred and twenty. Thus, under favorable conditions, the offspring of a single over-wintering house fly may in the course of a summer reach a figure almost beyond belief. With an uncared-for pile of horse manure in the vicinity of a house, therefore, flies are sure to swarm. Their number will practically be limited only by breeding opportunities. They are attracted to, and will lay their eggs in, human excrement. Under favorable conditions they will breed, to some extent, in this excrement. They swarm in kitchens and dining-rooms where food-supplies are exposed. They are found commonly in box privies, which are sometimes not far distant from the kitchens and dining-rooms. Therefore, with an abundance of flies, with a box privy near by, or with excremental deposits in the neighborhood, and with a perhaps unsuspected or not yet fully developed case of typhoid fever in the immediate neighborhood, there is no reason why, through the agency of contaminated flies alighting upon food-supplies, the disease should not be spread to healthy individuals. That it is so spread is not to be questioned. That under the unusual conditions of the army concentration camps in the summer of 1898 it was so spread to a shocking extent has been demonstrated by the army typhoid fever commission. And the remedy is plain. It consists of two courses of procedure: (1) Proper care of excreta; (2) The destruction of flies.

"On many farms where intelligent people live, the old-fashioned box privy has been done away with, and there has been substituted for it some form of earth closet. Where a good earth closet is in operation and the inhabitants of a farm appreciate the importance of using no other, and where in case of illness the excreta of patients are promptly disinfected, flies breeding in the neighborhood will have practically no opportunity to become contaminated with typhoid germs, except in the unlikely event (which further investigation may possibly show) that other animals than man are subject to this disease. The proper maintenance of an earth closet will add somewhat to the work of a farm, but this extra work will pay in the long run. While it is true that a box inclosure, if its contents are covered with lime every three or four days, will answer the purpose, a much better plan would be to use a large metal vessel, the surface of the contents being covered with earth after each operation and which may be removed, emptied, and replaced daily. Care should, of course, be taken to empty the contents of the vessel in a pit constructed in some well-chosen spot, from which the drainage would not be dangerous. With regard to the abolition of flies, the best measures will again naturally involve some trouble and expense. In a thickly settled country it will become necessary for some such measure to be generally adopted in order to be perfectly effective, but in an isolated farm-house the number of house flies may be greatly reduced by individual work. All horse manure accumulating in stables and barns should be collected, if not daily, at least once a week, and should be placed in either a pit or a vault or in a screened inclosure like a closet at the side or end of the stable. This closet should have an outside door from which horse manure can be shoveled when it is needed for manuring purposes. Each day's or week's accumulations after they are shoveled into the closet or pit, should be sprinkled over the surface with chloride of lime, and a barrel of this substance can be conveniently kept in the closet. If this plan be adopted (and these recommendations are the result of practical experience) house flies will have almost no chance to breed, and their numbers will be so greatly reduced that they will hardly be noticeable. Many experiments have been made in the treatment of manure piles in order to kill the maggots of the house fly, and the chloride-of-lime treatment has been found to be the cheapest and most efficacious. It has been stated above that the closet for the reception of manure should be made tight to prevent the entrance or exit of flies. A window fitted with a wire screen is not desirable, since the corroding chloride fumes will ruin a wire screen in a few days.

"While extended investigations have shown that the common house fly is the fly most to be feared in guarding against typhoid, on account of the fact that over ninety-nine per cent of the flies found in kitchens and dining-rooms and attracted to food-supplies are house flies, there are a few others which are attracted to and which may breed in human excrement that also have to be guarded against, and as these do not breed in horse manure the treatment just described will not be effective against them. The care of human excrement, however, will prevent the carriage of typhoid germs, even by these species. The little fruit flies of the genus Drosophila, which breed in decayed or over-ripe or decaying fruit, are the principal species in this category. Therefore, fruit storehouses or fruit receptacles should be screened and overripe fruit should not be allowed to remain in dining-rooms or kitchens for any length of time.

"While in malaria and typhoid we have two principal diseases common to the United States which may be conveyed by insects, the agency of these little creatures in the transfer of disease germs is much more widespread in warm countries, and it is by no means confined to human beings. In Egypt and in the Fiji Islands there is a destructive eye disease of human beings the germs of which are carried by the common house fly. In our Southern States an eye disease known as pink eye is carried by certain very minute flies of the genus Hippelates. In certain tropical countries a disease known as filariasis, which somewhat resembles certain forms of leprosy, is transferred among human beings by certain mosquitoes. There is good reason to suppose that the germs of the bubonic plague may be transferred from sick people to healthy people by bites of fleas. The so-called Texas fever of cattle is unquestionably transferred by the common cattle tick, and this was the earliest of the clearly demonstrated cases of the transfer of disease by insects. In Africa a similar disease of cattle is transferred by the bite of the famous biting fly known as the tsetse fly. The germs of the disease of cattle known as anthrax are carried by gadflies, or horse flies, and when these flies subsequently bite human beings malignant pustules may result. And other discoveries of this nature are constantly being made. Even the common bedbug is strongly suspected in this connection.

"One of the most important of these disease-transfer relations of insects which has been demonstrated is the recently-proved carriage of yellow fever by certain mosquitoes. The cause of yellow fever has always been a mystery, and, indeed, it is a mystery to-day in a measure, since although undoubtedly a disease of parasitic origin, the parasitic organism itself has not been discovered. During the summer and autumn of 1900 and spring and summer of 1901 the work of a commission of surgeons of the United States Army has demonstrated in Cuba beyond the slightest possible doubt that yellow fever is not conveyed by infected clothing of yellow-fever patients or by contact with such patients or by proximity to them, but that it is conveyed by the bite of a certain species of mosquito known as *Stegomyia fasciata*, which abounds in regions where yellow fever is possible. The bite of this mosquito, however, does not convey yellow fever to a healthy person until twelve days have elapsed from the time when the same mosquito has bitten a person suffering with the disease. It follows from this fact that by keeping yellow-fever patients screened from the possibilities of mosquito bites we can prevent the yellow-fever mosquito from becoming infected. It follows further that by preventing healthy people from being bitten by mosquitoes we can keep them free from the disease, even where infected mosquitoes exist. And it follows still further that by the adoption of remedial measures looking toward the destruction, in all stages, of the yellow-fever mosquito we may reduce to a minimum the possibilities of the transfer of the disease. After demonstrating the fact, the medical officers of the army in Cuba have put these measures into effect and the results have been most gratifying. The health of Havana has constantly improved, and at the date of present writing the public statement has just been made that during the month of October, 1901, there was not a single case of yellow fever in Havana, while October is usually the severest month for that disease, and in fact during the past ten years the average number of deaths in the city during that month from yellow fever has been 66.27. This discovery, and this practical demonstration of its truth, it seems must soon change all methods of quarantine in the United States, and it seems certain that in the future the Gulf cities will no longer dread the disease or remain subject to the great vital and economic loss to which they have been subject from occasional yellow-fever outbreaks during past generations."

GRASSHOPPERS, OR LOCUSTS.

During the season of 1902, portions of California, chiefly isolated tracts of the Sacramento and San Joaquin valleys, were threatened by apparently dangerous numbers of locusts or grasshoppers, and fear was felt and prognostications made that the damage from their depredations would be large.

On their appearance in some places the plan of destroying them by burning-over the fields of grass which harbored them was advised and carried out, leading in some cases to personal encounters, in others to the arrest of parties engaged in firing the fields or ordering it done, and in still other cases suits for damage have been threatened or commenced.

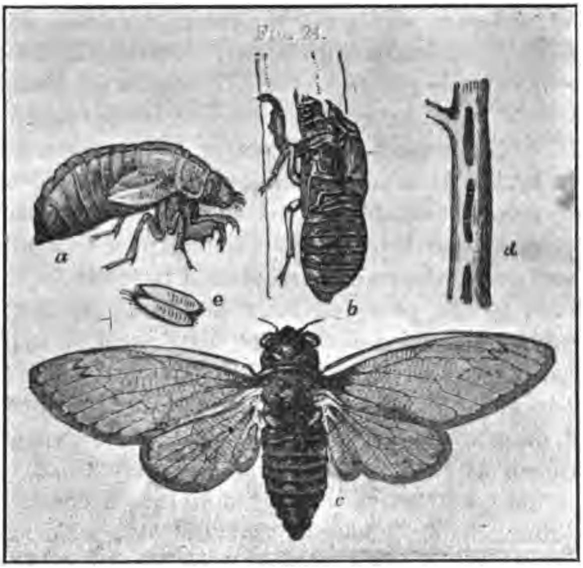


FIG. 1. THE PERIODICAL CICADA (*C. septendecim*).
(*a*) Pupa ready to change; (*b*) Pupa skin from which the adult (*c*) has emerged; (*e*) Eggs taken from the egg-punctures (*d*).

Fortunately the losses from the ravages of the grasshoppers were small; the damage resulting from the ill-advised and dangerous plan of setting fields afire at such a dry season as prevails in this State in the months of June and July, for the purpose of destroying the grasshoppers, we believe greatly exceeded any damage caused directly by the insects.

Alarm was increased by the publication, in some newspapers, that the plague with which we were afflicted was the seventeen-year locust, whose appearance had been predicted in some of the States east of the Rocky Mountains. Such predictions were without foundation, because the seventeen-year locust has never been known to exist in an arid or semi-arid region. This locust confines its movements to the moist eastern portions of this country, and in the northern part has a periodicity of seventeen years and in the southern part one of thirteen years. It belongs to a different order of insects—the Hemiptera; is called Cicada (Fig. 1), and has transparent wings, like the common house fly. The damage which it causes results from the female making slits in small trees or twigs in which to deposit her eggs, and which often destroys young trees. The only representative we have on this Coast is a Cicada known as the "Harvest Fly," or "Jarr Fly," which appears annually, but never in any great numbers; it causes no appreciable damage, and its high, sharp trill is only occasionally heard in warm, late summer days issuing from a clump of bushes or weeds.

The illegality of burning grass on pasture lands infested with grasshoppers, without the consent of the owners, having been declared in an opinion given by the Attorney-General, at the request of the Secretary of this Board, more reasonable means were devised for combating the threatened plague, and this Board had "hopper-dozers" made and ready for distribution when a demand should be made for them. Advice was also given to use poisoned bran according to the formula of this Board. The "hopper-dozers" were distributed on application, but as the applicants were few in number, it is evident that the grasshoppers did not exist in many localities or at least not in dangerous numbers.

The locust, or grasshopper, from which the most danger was apprehended is known as *Melanoplus devastator*, closely allied to the *Melanoplus spretus*, the destructive Rocky Mountain locust. There is no reasonable apprehension, however, that the destruction in California can ever be at all comparable to that caused by the Rocky Mountain locust in some of the Western States and Territories.

There is another grasshopper, belonging to the genus *Pezotettix*, which sometimes causes a limited amount of damage in this State. This species is generally found in shady localities, in low swales where the ground remains moister and the vegetation greener than on the high lands, and along the banks of streams. It is this grasshopper which sometimes frequents alfalfa fields. Its wings are short and rudimentary, resembling the wing-pads of immature winged grasshoppers, but it is very active and capable of jumping long distances. There are many other varieties in this State which sometimes aid in causing damage.

California has in the past suffered from devastating hordes of grasshoppers in several localities. Bulletin No. 25, of the U. S. Department of Agriculture, cites a number of instances. There were no means of positively identifying the species that committed the ravages, but it is probable that *Melanoplus devastator* was responsible for the largest share of the damage, no doubt assisted by other species.

In 1722, 1746, 1749, 1753, 1754, 1765, 1767 grasshoppers appeared in California. (A. S. Taylor, Smithsonian Report, 1858.)

The following, up to 1885, are from the same authority:

1823. Franciscan Missions of Upper California.

1827 or 1828. "Ate up all the growing crops."

1834 or 1835. "Destroyed the crops of the rancheros or missions, with the exception of wheat."

1838–1840. For these three years destroyed the crops and gardens about San Francisco and San Rafael.

1846. Corn and frijoles consumed on the Salinas plains.

1852. Near Centerville, Alameda County, California, and also in Oregon. They were noticed in the same locality every year since, up to 1897, but in very moderate numbers. (Lorenzo G. Yates.)

1855. The most noted year for ten years on the Pacific Coast—California, Oregon, and Washington. Great damage and many immense flights witnessed in this region.

1856. Lower California; small numbers.

1859. Pitt River Valley, California.

1862 or 1863. Hornitos.

1866 or 1867. Swarm fifteen miles wide seen near Stockton, California.

1869. Tulare County, California.

1873. Lower and Southern California.

1877. Fresno County, California.

1885. San Joaquin Valley of Northern California; Southern Oregon.

Another species—the Pellucid locust (*Camnula pellucida*)—has occasionally committed ravages in this State. In 1878 immense swarms appeared in the Sierra Valley, and in 1877 and 1879 they ravaged this coast near Santa Barbara.

There have been other instances of ravages by grasshoppers in California, causing considerable local damage.

From the foregoing record it will be seen that farmers and horticulturists should be prepared to successfully combat grasshoppers, when a season favorable for their propagation in destructive numbers arrives. It would be wise for farmers to observe where they oviposit, and to take measures to destroy their eggs before they are hatched, which is the most effective of all measures to prevent future damage. The places selected by grasshoppers for oviposition are always on ridges not subject to overflow, where the ground is firm but not too hard; they never oviposit in adobe or loose, sandy soils, or where vegetation is dense.

Bulletin No. 55, of the Minnesota Agricultural Experiment Station, contains the following description of the oviposition of the Rocky Mountain locust, which is applicable to ours: "The holes for the reception of the eggs are made by means of two pairs of horny valves at the tip of the abdomen of the female. These open and shut rapidly and are well adapted to execute this function. The female, by pressing the tip of her abdomen forcibly against the soil, rapidly opens and shuts these hard-pointed valves and soon pushes them into the ground, thus drilling a hole. In a short time the entire and greatly extended abdomen is inserted in the little curved and more or less oblique cavity. The legs are hoisted above the back during the operation of drilling this hole, which requires more or less time, depending entirely upon the character of the soil. As soon as the hole is finished it is filled with a frothy and mucous material."

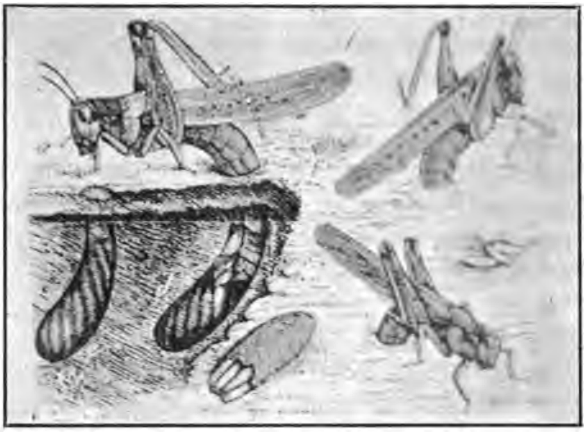


FIG. 2. ROCKY MOUNTAIN LOCUST OVIPOSITING.
(*a*, *a*) Females with abdomen inserted in the soil; (*b*) An egg-pod broken open and lying on the surface; (*c*) A few scattered eggs; (*d*) Section of soil removed to show eggs being put in place; (*e*) An egg-pod completed; (*f*) An egg-pod sealed over.

Professor Riley describes the method of egg-laying, as follows: "By repeatedly extracting and studying specimens in every stage of oviposition, we have been able to ascertain the exact method by which the egg mass is formed. If we could manage to watch a female from the time the bottom of her hole is moistened by the sebific fluid, we should see the valves all brought together, when an egg would pass down the oviduct along the ventral side, and, guided by a little finger-like style, pass in between the horny valves, and issue at their tips amid the mucous fluid already spoken of. Then follows a period of convulsions, during which more mucous material is elaborated, until the whole end of the body is bathed in it, when another egg passes down and is placed in position. These alternate processes continue until the full complement of eggs are in place, the number ranging from twenty to thirty-five, but averaging about twenty-eight. The mucous matter binds all the eggs in a mass, and when the last is laid, the mother devotes some time to filling up the somewhat narrower neck of the burrow with a compact and cellular mass of the same material, which, although light and easily penetrated, is more or less impervious to water, and forms a very excellent protection. When fresh the mass is soft and moist, but it soon acquires a firm consistency."

It is obvious that the best method of exterminating or reducing the number of grasshoppers would be to destroy the eggs or prevent their hatching, which could be done readily by plowing the ground in the fall or winter and thoroughly harrowing, which would break many of the eggs, or would bury them so deeply that the young in their weak state when first hatched would be unable to reach the surface, and would thus perish.

Like all other insects, grasshoppers in growing have to molt or shed their skins, which is done from three to seven times in the different species. But, unlike many insects, they have no period of quiescence, or only for a short time; they are active and voracious at all stages of growth. The young grasshopper differs but slightly in appearance from the adult, except in size, the most striking variance being in the absence of wings or only rudimentary ones. The wings first appear as small pads and gradually become larger after each molt, until the mature stage is reached, when the insects are prepared for flight.

The following graphic description of the last molt is from the First Annual Report of the U. S. Entomological Commission:

"When about to acquire wings the pupa crawls up some post, weed, grass-stalk, or other object, and clutches such object securely with the hind feet, which are drawn up under the body. In doing so the favorite position is with the head downward, though this is by no means essential. Remaining motionless in this position for several hours, with antennæ drawn down over the face, and the whole aspect betokening helplessness, the thorax, especially between the wing-pads, is noticed to swell. Presently the skin along this swollen part splits right along the middle of the head and thorax, starting by a transverse, curved suture between the eyes, and ending at the base of the abdomen. Let us now imagine that we are watching one from the moment of splitting. As soon as the skin is split, the soft and white fore-body and head swell and gradually extrude more and more by a series of muscular contortions; the new head slowly emerges from the old skin, which, with its empty eyes, is worked back beneath, and the new feelers and legs are being drawn from their casings and the future wings from their sheaths. At the end of six or seven minutes our locust—no longer pupa and not yet imago—has its four front pupa legs generally detached and the insect hangs by the hooks of the hind feet, which were anchored while yet it had that command over them, which it has now lost. The receding skin is transparent and loosened, especially from the extremities. In six or seven minutes more of arduous labor—of swelling and contracting—with an occasional brief respite, the antennæ and the front four legs are freed, and the fulled and crimped wings extricated. The soft front legs rapidly stiffen, and, holding to its support as well as may be with these, the nascent locust employs whatever muscular force it is capable of to draw out the end of the abdomen and its long hind legs. This in a few more minutes it finally does, and with gait as unsteady as that of a new-dropped colt, it turns around and clambers up the side of the shrunken cast-off skin, and there rests while the wings expand and every part of the body hardens and gains strength—the crooked legs straightening and the wings unfolding and expanding like the petals of some pale flower. The front wings are first rolled longitudinally to a point, and as they expand and unroll, the hind wings, which are tucked and gathered along the veins, at first curl over them. In ten or fifteen minutes from the time of extrication, these wings are fully expanded and hang down like dampened rags. From this point on, the broad hind wings begin to fold up like fans beneath the narrower front ones, and in another ten minutes they have assumed the normal attitude of rest. Meanwhile the pale colors which always belong to the insect while molting have been gradually giving away to the natural tints, and at this stage our new fledged locust presents an aspect fresh and bright. If we now examine the cast-off skin, we shall find every part entire with the exception of the rupture which originally took place on the back; and it would puzzle one who had not witnessed the operation to divine how the now stiff hind shanks of the mature insect had been extricated from the bent skeleton left behind. They were, in fact, drawn over the bent knee-joint, so that during the process they were doubled throughout their length. They were as supple at the time as an oil-soaked string, and for some time after extrication they show the effects of this severe bending by their curved appearance. The molting, from the bursting of the pupa skin to the full adjustment of the wings and the straightening of the legs of the perfect insect, occupies less than three quarters of an hour, and sometimes but half an hour. It takes place most frequently during the warmer part of the morning, and within an hour after the wings are once in position the parts have become sufficiently dry and stiffened to enable the insect to move about with ease; and in another hour, with appetite sharpened by long fast, it joins its voracious comrades and tries its new jaws. The molting period, especially the last, is a very critical one, and during the helplessness that belongs to it the unfortunate locust falls a prey to many enemies which otherwise would not molest it, and not infrequently to the voracity of the more active individuals of its own species."

In 1855 grasshoppers in immense swarms invaded Sacramento and the districts along the river adjacent to the city, causing considerable damage to the few farmers then in this locality; but there has been no visitation since that date. Their breeding-grounds were probably only a few miles east of the city, on then wild land, but now under cultivation. From this fact, we believe that their migrations seldom extend many miles from their breeding-places; but possibly lack of food, favorable winds, etc., may sometimes cause them to move considerable distances.

Grasshoppers in this locality usually make their appearance during the latter part of May, and in the following months of June and July cause their greatest devastation. After that time, effects of disease, attacks of natural enemies, and their extension over a wider area so reduce their numbers in a given locality that their depredations are comparatively so small as to be unnoticed.

Grasshoppers generally first appear in greatest numbers along the edges of the foothills, which is their breeding-ground, in isolated swarms, often many miles apart. When first hatched, their powers of destruction are not great; but with each molt their voraciousness increases, and unless steps are promptly taken to combat them, or unless attacked by their natural enemies in numbers, cultivated crops in their path may be seriously injured or destroyed by them.

The grasshopper has many enemies. A Tachina fly, about the size of the common house fly, and which it much resembles, is one of the most abundant and most destructive to the hoppers. During the late outbreak of grasshoppers near Roseville, we are informed that great numbers of these flies might be seen in the air over the fields infested with grasshoppers, and when a grasshopper would rise from the ground a Tachina fly would immediately strike the grasshopper and deposit its egg, which would shortly hatch into a maggot and eat its way into the vital parts of the grasshopper, thus destroying it. When fully developed, the maggot enters the ground to pupate and soon emerges as a full-winged fly.

Mr. Compere, agent of this Board, while in New South Wales, in 1900, procured a few grasshoppers which had been parasitized by a dipterous fly, and although they were dead before being shipped, forwarded them to San Francisco to Alexander Craw, Quarantine Officer of this Board. A. M. Lea, Entomologist of Tasmania, informed Mr. Compere that he had found that 90 per cent of the female and 15 per cent of the male grasshoppers were parasitized by this fly. Mr. Craw placed the dead grasshoppers in a breeding-jar, and in a short time the parasites appeared. They were liberated in the Livermore Valley in 1900, the vineyards of which are often subject to the ravages of grasshoppers. It is probable that by this time they may have spread over the interior valleys of the State, and entered upon their career of parasitizing their hosts, which would account for the apparently sudden disappearance of the grasshoppers in many localities where they had been numerous and where fears of damage were entertained. It is to be hoped that this may prove true, and if so it will be another instance of the great value of the efforts of this Board in obtaining predaceous and parasitic insects to fight our injurious pests, such as the *Vedalia cardinalis*, which proved effective against the cottony-cushion scale, and the *Rhizobius ventralis* and *Scutellista cyanea*, effective against the black scale.

This fly (*Masicera pachytyli*, Sk.), which is represented in the accompanying cut, belongs to the order Diptera, the same as our common house fly, which it resembles. It has a bristly appearance and is formidable looking, because of the spines projecting in every direction. It is often found about flowers and green vegetation. The adult fly itself is of no economic importance, but the larvæ are parasitic, and in Australia have proved most efficient in lessening the number of grasshoppers. It is the natural enemy of the grasshopper, feeding most voraciously on the adipose tissues of its victim, but avoiding the vital parts. It feeds in the thorax and abdomen of the grasshopper, and frequently three or four may be found in a single grasshopper. A grasshopper infested by these maggots soon shows signs of feebleness, ceases feeding, and dies in a short time, the maggots escaping, often before the death of the grasshopper. The maggots, after extricating themselves from the ground to pupate, and emerge in five or six days as perfect flies.

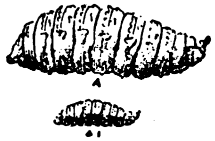


FIG. 4.
A. Larva of dipterous fly, parasitic on plague locust; magnified.
A1. Same, natural size.

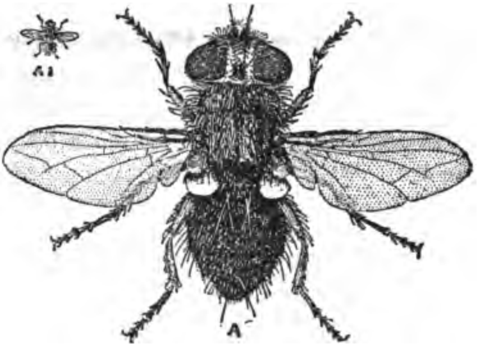


FIG. 3.
A. Tachina fly (*Masicera pachytyli*), a parasite of the plague locust; magnified.
A1. Same, natural size.

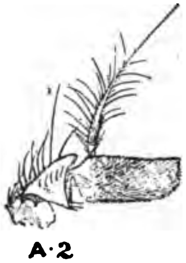


FIG. 5.
A 2. Antenna of *Masicera pachytyli*.

Birds also greatly aid in the destruction of grasshoppers. The common meadowlark is among the most active destroyers of this insect, and for this alone it is entitled to the protection of the law which it now enjoys. When grasshoppers are plentiful the meadowlark does not eat the entire insect, but only the abdomen or a portion of one, and this habit enables it to destroy a great number every day. Blackbirds of all varieties are also great aids in destroying them, but, unfortunately, the birds are breeding and taking care of their young when the grasshoppers first appear, and as their nesting-places are close to water in the tules and the breeding-grounds of the grasshoppers are near the foothills, perhaps miles away, their services are not near so valuable in proportion to their numbers as are those of the meadowlark, whose home may be in the midst of the young grasshoppers or adjacent thereto. Later in the season the blackbirds become fearfully destructive of grasshoppers. Woodpeckers also for a time cease their arboreal habits to prey upon the grasshoppers on the ground. While the sparrowhawks, owls, sparrows, ground larks, and in fact all land birds, except the dove, give their welcome aid in destroying the pests. It is said that skunks and gophers eat them, as do also toads, frogs, and snakes.

Grasshoppers, like all insects that gather in large swarms, are subject to contagious diseases, which rapidly spread and carry them off in large quantities, often almost exterminating them. The fungous disease is one of the most fatal to grasshoppers in some countries. Attempts have been made to introduce in this vicinity a South African fungus particularly fatal to grasshoppers, but we have not learned of the results and doubt that it will prove effective in California, because of our dry climate at the season of the year when the grasshoppers are most abundant, a moist climate being required for its successful propagation.

But when grasshoppers become numerous and destructive, it is not wise for farmers or horticulturists to await the action of natural causes, for proximity to cultivated areas does not give the necessary time for their action before great damage has been done. The farmer must, therefore, be prepared to defend his crop. As before stated, the best method to combat the pests is to plow the land known to contain eggs before the grasshoppers are hatched. Bulletin No. 55, of the Minnesota Agricultural Experiment Station, recommends plowing even after the grasshoppers have hatched and reached the surface, as follows: "In such case plowing should commence at the outer boundary of the grasshoppers, and a number of plows should be used at the same time, the plows following each other as closely as possible. The grasshoppers are in this manner forced to the center, where a black mass of struggling insects are crowded together. But few of them will escape, for as one plow makes a furrow, which is rapidly filled with grasshoppers, the following plow covers them up and most are buried alive, only a few near the edge escaping." After a few furrows have been plowed around the area infested by grasshoppers, it might be advisable to burn the grass on the inclosed ground to destroy the grasshoppers, for with this precaution the danger of fire getting beyond control would be reduced to a minimum.

The "hopper-dozers" have proved one of the most effective means of destroying grasshoppers. Their construction is simple, and any farmer can make them from the following description:

A piece of ordinary sheet-iron is turned up 1½ inches around the edges and riveted at the corners, which makes a shallow pan about 10 feet long, 2 feet broad, and 1½ inches deep. At the back of the pan is fastened a standard of light wooden frame, as long as the pan and about 2 feet high. Over this frame a canvas is stretched, for the purpose of throwing back any grasshoppers that otherwise would jump over the pan. On the bottom of the pan are riveted small strips, which can be fastened to three runners on which the pan rests and which are usually made from pieces of board with a curve in front to prevent them catching in the ground. The front ends of the runners are fastened to a cross piece, which is drawn by two ropes, one at each end. These ropes are fastened to a singletree. Two "hopper-dozers" are sometimes fastened to a long pole by short ropes, and they are easily drawn by one horse. Two can be used only on clean and level land. When the land is uneven only one can be used to advantage. In front of the pan is fastened a piece of rope or a small pole, which sweeps the ground, stirs up the grasshoppers, and makes them jump into the pan. In the pan is placed crude oil, or water, on which a pint of kerosene oil is thrown, and the canvas standard is also moistened with kerosene or crude oil. If water and coal oil are used, partitions should be placed in the pan to prevent the fluids from splashing out, or sacks may be thrown over the surface of oil and water. The machine is drawn on the fields where the hoppers are the thickest, and in a short time is partially filled with insects.

The effect of kerosene oil is so great that even the slightest touching of the canvas or the pan is certain death to the hoppers, for the oil will spread over their bodies, causing a paralysis, which is first shown by the stiffening of the legs. A large portion of the hoppers that fall into the pan will immediately hop out again, but they die in a very short time. It is estimated that only one out of every ten die in the pan, nine jumping out again. Kerosene also leaves a very strong odor which is disliked by the insects, and they stop feeding and move about in their efforts to escape it.

Poisoned baits are also very effective in the destruction of the hoppers where pans can not be used, as in vineyards and cultivated crops. The best is that recommended by this Board, which is as follows: Thoroughly mix 40 pounds of bran, 20 pounds of middlings, and 20 pounds of arsenic, adding two gallons of cheap molasses, and enough water to moisten the whole. This should not be scattered promiscuously over the ground, but a tablespoonful of the mixture should be placed on a shingle or shake, or on wooden plates such as are used by bakers under pies, the latter being very cheap. This will enable the poison to be removed when the danger is past, and not cause the death of stock, poultry, or the birds, which are the farmer's best friends. The receptacles containing the poison should be placed about eight feet apart, and if the hoppers are very numerous, a second row should be placed about ten feet distant from the first. The hoppers are very fond of this mixture and will greedily devour it. Should the mixture become hardened, it must be moistened to soften it.

Bulletin No. 25, of the U. S. Department of Agriculture, gives the following as the best means of protecting fruit and shade trees: "Where the trunks are smooth and perpendicular they may be protected by whitewashing. The lime crumbles under the feet of the insects as they attempt to climb and prevents their getting up, but they gradually wear off the lime and reach a higher point each day, so that the whitewashing must often be renewed. A strip of smooth, bright tin, three or four inches wide, answers even better for the purpose. The tin must be high enough from the ground to prevent the grasshoppers from jumping beyond it. Cotton batting, which encircles the tree, will entangle their legs, and forms a good obstruction. Strips of paper covered with tar; stiff paper tied on so as to slope, roof fashion; strips of glazed wall paper, and thick coatings of soft soap, have been used with varying success, but none equals the bright tin. A certain proportion of the insects, when they become fledged, will fly into the trees, and as they do most damage during the night, the trees should be unloaded before dark."

Smudging has also been used to ward off the winged swarms. Anything which produces a dense smoke will be effective, such as straw, coal tar, or crude oil. The use of smoke will be effective in proportion as farmers combine together and produce it simultaneously over large areas.

By using either the "hopper-dozers" or the poisoned bait, or both combined, it is possible for the farmer and horticulturist to protect his crops from any swarms of grasshoppers or locusts ever recorded in California. These are the plans recommended by the U. S. Department of Agriculture and by Agricultural Experiment Stations; and have been successfully tested in many States, after the pests have appeared. But the best and most thorough safeguard against this pest is the destruction of the eggs in the breeding-grounds.

PLANT LICE, OR APHIDS.

The plant lice, or aphids, are among the most numerous, both as regards species and individuals, of all known insects, and the destruction caused by them is commensurate with their numbers. There is scarcely a plant that is not attacked by them, and some plants, like the grape, peach, apple, cabbage, etc., have aphids peculiar to them.

They are all small, soft-bodied insects, with a body more or less pear-shaped, the winged forms having two pairs of delicate, transparent wings. The majority of plant lice are aërial in their habits, but some varieties also assume a subterranean form, and these are among the most destructive and widespread, the dreaded phylloxera and woolly aphis being the best known.

Their methods of reproduction are most unique and peculiar to themselves, and the different forms they assume—some winged and others wingless, some laying eggs, others bringing forth young alive and often without the intervention of the male, which in some forms has never been recognized—make them at once interesting and puzzling to the naturalist and entomologist.

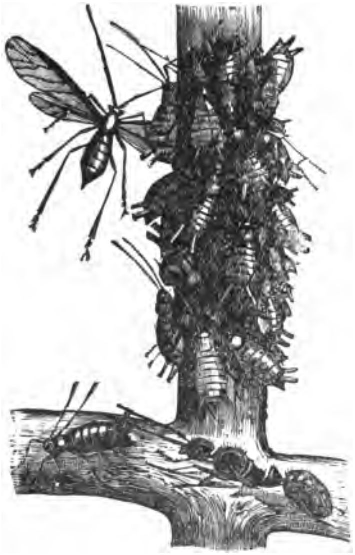


FIG. 1. Plant Lice and Ant.

In many varieties a sweet substance is produced, called honey-dew, which is exuded through two tubes situated on the back near the posterior part of the insect, which can readily be seen with the naked eye. This is the substance, when produced in large quantities, that drips from shade trees and spots the sidewalks beneath. This honey-dew is devoured by bees, wasps, and ants.

It is commonly believed that ants destroy plant lice; but the contrary is the fact. The ant treats and regards plant lice as milch cows. An ant will approach a plant louse, place its antennæ on its back, stroking it gently, when the louse will give forth its honey-dew, which the ant will immediately drink up. The ants take good care of their cows, and will transport them to new pastures when old ones fail, thus aiding greatly in their distribution. In fact, the remedy recommended for the corn-root louse is the destruction of ants' nests, the inmates of which mine along the roots of the corn, collect plant lice, and distribute them on the roots.

Plant lice obtain their sustenance by sucking the juices of plants which they infest, by inserting their proboscis in woody plants, in the tender terminal growths, peduncles of roses, etc., and in the succulent parts of plants and roots. While the amount taken by an individual is almost infinitesimal, their immense numbers often cause most serious injury to the plant they infest, and sometimes its destruction.

WOOLLY APHIS (*Schizoneura lanigera*).

Some plant lice, in addition to honey-dew, secrete a bluish-white, flocculent, cottony substance, which oftentimes almost completely conceals them, appearing to be tufts of cotton attached to leaves and twigs. The best known of the cotton-secreting species is the Woolly Aphis (*Schizoneura lanigera*), which has been distributed in every country where the apple is grown, and is one of the best known and most annoying pests of the fruit-grower. They can be seen infesting the branches and trunk of a tree, in which they form pits, the bark apparently ceasing to grow at the point of attack, but which swells into a ridge about the cluster of aphids. Those that appear above ground can be controlled without trouble, but the form which appears on the roots and produces gall-like swellings is much more difficult to extirpate. The injury to the tree is caused by the sucking of the sap, which deprives it of nourishment, and by the poisoning of the plants, shown by the galls on the roots.

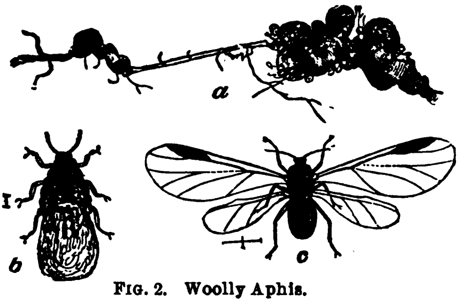


FIG. 2. Woolly Aphis.

Professor Marlatt, of the U. S. Department of Agriculture, says: "The damage is particularly serious in the case of nursery stock and young trees, and is less important after the tree has once become well established and of some size. Where this insect is abundant all the roots of a young tree, to the depth of a foot or so, become clubbed and knotted by the growth of hard fibrous enlargements, with the result in a year or two of the dying of the rootlets and their ultimate decomposition, with attendant disappearance of the galls and also of the lice, so that after this stage is reached the cause of the injury is often obscure. On the trunks the presence of the lice sometimes results in the roughening of the bark or a granulated condition, which is particularly noticeable about the collar and at the forks of branches, or on the fresh growth around the scars caused by pruning, which latter is a favorite location.

"On the water shoots they collect, particularly in the axils of the leaves, often eventually causing them to fall; and on the tender green side of the stems. The damage above ground, though commonly insignificant, is useful as an indication of the probable existence of the lice on the roots. A badly attacked tree assumes a sickly appearance and does not make satisfactory growth; the leaves become dull and yellowish; and even if not killed outright, is so weakened that it becomes especially subject to the attacks of borers and other insect enemies. Injuries from the woolly aphis are almost altogether confined to the apple, even the wild crab not being so liable to attack or at least injury by it. There is, however, some difference exhibited by different varieties of apple in immunity, and particularly is the Northern Spy proof against it; and it is possible that, as in the case of grape phylloxera, by employing root stocks from seedlings of the more resistant varieties or from wild crabs, considerable protection would result. The character of the soil also exerts some influence—that is, loose, dry soils are favorable, and wet, compact ones are unfavorable to the aphis.

"The common forms, both on the root and above ground, are wingless lice, not exceeding one tenth of an inch in length, of a reddish-brown color and abundantly covered, especially in the aërial form, with a flocculent waxy secretion. They are the so-called agamic females, and reproduce themselves by giving birth, as observed by many entomologists, to living young, indefinitely, perhaps for years, without the intervention of other forms. The newly-born larvæ have none of the white secretion, which, however, soon appears as a minute down when they begin to feed. These lice are also peculiar in lacking the honey-tubes common to most aphids, but exude the honey-dew from the tip of the body. In October or November, or earlier in the south among the wingless ones, numbers of winged individuals appear which are also females and the parents, as shown by the observations, partly unpublished, of Messrs. Howard and Pergande, of a true sexed generation of minute, wingless, larviform lice, the females of which, as in the case of the grape-root louse, give birth to a single 'winter egg.' This egg is attached within a crevice of the bark, and probably, following the analogy of the phylloxera, hatches in the spring into a female aphid which originates a new aërial colony.

"The winged females appear somewhat abundantly in autumn, and are one of the means of dispersal of the insect. They are very minute, clear-winged, gnat-like objects, greenish-brown, almost black in color, with the body covered with more or less of the cottony secretion.

"The aërial colonies are probably killed out every winter in the colder northern districts, but in the warmer latitudes the partly-grown individuals at least survive, protected in crevices or under bits of bark and remain more or less active during winter and renew the colonies the following spring. This has been shown to be true in the District of Columbia, and also in the interior regions of the same latitude, in spite of the much colder winters. The root form survives the winter usually in an immature condition, viz.: larvæ in various stages of development; and both in latitudes where the aërial forms are killed by the severity of the winter, and elsewhere, it seems probable that there is a regular upward migration in spring and early summer from the roots, the aërial colonies appearing first near the crown and at a later period on the higher parts of the tree. At any time during summer and fall there may be migrations to the roots, and throughout the year the subterranean colonies are maintained.

"The spread of the insect is accomplished in part by the viviparous females which appear in late summer, but quite as commonly perhaps by the transporting of young or partly grown individuals from tree to tree, or to distant orchards, by means of birds or insects to which they have attached themselves. Its wide distribution is usually dependent on the traffic in nursery stock."

Among the many remedies for the destruction of the woolly aphis, hot water has been generally recommended, but has been only partially successful. As much as possible of the surface soil should be removed, so as to facilitate wetting the roots. This remedy should be used while the trees are dormant.

The rosin solution, prepared according to the formula of this Board, for winter use upon deciduous trees for pernicious scales and lecaniums, has proved beneficial when applied by pouring it on the roots and swellings and by spraying on the trunks and infested limbs.

Finely ground tobacco, when applied at the rate of two to five pounds to the tree, has proved beneficial both by destroying the aphis and by acting as a repellant. From four to six inches of the soil should be removed for a distance of two feet from the trunk before applying the tobacco dust, afterward replacing the soil. The tobacco kills the aphids by leaching through the soil, and acts as a bar for a year or two to reinfestation. Tobacco is also a good fertilizer.

Bisulphide of carbon has also been used, but its use requires caution, or the tree may be killed. It should be applied in two or three holes around the tree to a depth of six or twelve inches, and not closer than eighteen inches to the trunk. The bisulphide penetrates throughout the soil and promptly kills the aphids.

Nursery stock, if not badly infested, can be cleansed by immersing in kerosene emulsion. Badly infested stock should be destroyed.

CABBAGE LOUSE (*Aphis brassicæ*).

This plant louse often occurs in immense numbers on the cabbage and allied plants, and is most destructive to the plants it infests. It appears every season, and unless measures are taken to destroy the lice, plants will become weak and fail to grow.

The wingless viviparous female is greenish-gray in color, with black spots on each side of the abdomen, usually obscured by a whitish secretion. The eyes and legs are black. The winged viviparous female is yellowish green, eyes black, the lobes of the thorax, honey tubes, and legs brown. The male has never been observed, nor is it known where the winter is passed.

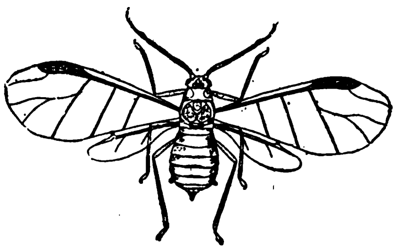


FIG. 3. Cabbage Aphis.

The exposed life of the cabbage lice makes them an easy prey to predaceous and parasitic insects, but sometimes they gather in such numbers that it is necessary to apply remedies to check their injuries. The ordinary whale-oil soap is a very effective remedy, and is prepared at the rate of one pound to eight gallons of water; kerosene emulsion is also recommended and is very penetrating. The plants should be thoroughly sprayed as soon as the lice appear, and the treatment should be repeated whenever necessary, as they are almost certain to reappear to some extent. Ground tobacco is also very satisfactory, as well as the tobacco decoction. To be effective, it is essential that the applications should be thorough. These poisons act by clogging the spiracles or by entering the body through them.

THE WHEAT APHIS (*Siphonophora avenæ*).

This louse in some years has caused great losses to grain-growers by sucking the sap from the leaves, stem, and young ears of grain, causing a decided shrinkage in the yield of wheat. Rye is also sometimes subject to its attacks. The winged insect is green, of various shades, with a large, oval spot on each side of the thorax and a row of dark-colored spots on each side of the abdomen. The wingless ones are more uniformly green in color.

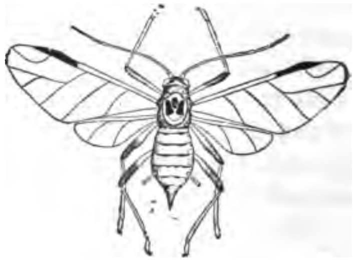


FIG. 4. Wheat Aphis.

It is difficult to apply any artificial remedy for these insects, on account of the extent of the fields and the vast quantity of insecticides that would be necessary to accomplish their destruction. Happliy they are subject to the attacks of numerous predaceous and parasitic insects, which prevent their numbers from becoming overwhelming. The causes which lead to their enormous increase in certain years are obscure and unknown, but mild winters are seemingly favorable for their propagation in the following spring.

The following description of its life history is given in Bulletin No. 72 of the New Jersey Agricultural Experiment Station:

"It has already been indicated that we do not know the full life history of this species and that we do not know the male. We know that it makes its appearance in winter wheat when it is out of the ground, flying from we know not where. The winged lice are few in number and they do not breed very fast. As winter approaches the lice crawl downward along the stem and get underground on the roots. These root forms are wingless, and they continue their work under the snow and wherever mild weather prevails, bringing forth young. With the approach of spring they crawl up the leaves and stalks, winged forms appear and they scatter, seeking fresh fields, where they multiply greatly. They disappear before the wheat is harvested, and what becomes of them at that time we do not know. There was never a male of this wheat louse known, and there was never any evidence that the species ever has a true egg."

THE HOP LOUSE (*Phorodon humuli*).

This insect is very destructive in the hop yards of Europe, the Atlantic States, and Oregon. In the latter State it is estimated that the loss from this source amounts to fully one twelfth of the crop. It has been reported that it has made its appearance in this State in some of the numerous hop yards, but as it closely resembles some of the other species a mistake may have been made in its identification.

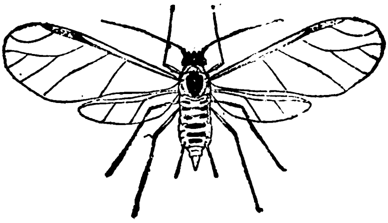


FIG. 5. Hop Aphis (winged).

The life history of this aphid has been closely investigated by patient observers. Professor C. V. Riley gives the following as its life history: "Wherever it occurs, whether in England or on the continent of Europe, in New York, Wisconsin, or on the Pacific Coast, the hop-plant louse has substantially the same life round. The eggs are laid in the fall on different varieties and species of the plum, both wild and cultivated. They are small, glossy, black, ovoid, and are attached to the terminal twigs, especially in the more or less protected crevices around the buds. From this egg there hatches in the spring, about the time when the plum buds begin to burst, a stout female plant louse, known as the stem mother, which differs from the summer individuals by having shorter legs and shorter honey tubes. She give

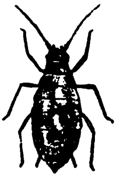


FIG. 6. Hop Aphis (wingless).

birth, without the intervention of the male, to living young, and this method of propagation continues until the last generation of the season. The second generation grows to full size and gives birth to a third, which becomes winged and develops after the hops have made considerable growth in the yards. The winged lice then fly from the plums to the hops, deserting the plum trees entirely and settling upon the leaves of the hops, where they begin giving birth to another generation of wingless individuals. These multiply with astonishing rapidity for from five to twelve generations, carrying us in point of time to the hop-picking season. (Each female is capable of producing on an average about one hundred young, at the rate of three per day under favorable conditions. Each generation begins to breed about the eighth day after birth, so that the issue from a single individual runs up, in the course of a summer, to trillions. The issue from a single stem-mother may thus, under favorable conditions, blight hundreds of acres in the course of two or three months.) There then develops a generation of winged females, which fly back to the plum tree and give birth to the true sexual females, which never acquire wings and never leave the plum tree. By the time this generation has matured, which involves but a few days, varying according to the temperature, belated winged individuals, which are the true males, fly in from the hop fields. These fertilize the wingless true females upon the plum leaves, and these soon after lay the winter eggs. Thus there is but one generation of sexed individuals produced, and this at the close of the life round—the females, wingless, on plum trees; the males, winged, on hops. All intervening generations are composed of virgin females only (parthenogenetic). This is the invariable round of the insect's life."

From the foregoing life history the two most vulnerable points to attempt its destruction are, in the spring while it is yet on the plum trees, and in the fall before the male leaves the hop yards. Plum trees should be sprayed to kill the lice before they migrate to the hop yards in the spring, and all hop vines should be burned or drenched with kerosene as soon as the hops are removed, in order to destroy the male, which does not leave the hop yards until some time after the hops are picked. Hop-growers should, if possible, not permit any wild or cultivated plum trees to grow near their hop yards. As insecticides, kerosene emulsion and whale-oil soap may be used. The following is the formula for the spray used in Oregon: Quassia chips, 8 pounds; whale-oil soap, 6 pounds; water, 100 gallons. The quassia chips should be fresh and the whale-oil soap not less than eight per cent strength. Spray as soon as the aphis appear, and continue as long as practicable.

BLACK APHIS OF THE PEACH (*Aphis persica-niger*).

This aphis has proved very destructive to the peach trees of the States on the Atlantic seaboard, and as it exists in two forms—aërial and subterranean, similar to the woolly aphis—its control is subject to all the perplexities of the latter aphis. It attacks the leaf buds when they are pushing in the spring, and so numerous do they become that they frequently kill young trees and seriously damage large branches on older trees. The following is the description of this aphis by Alexander Craw, Quarantine Officer and Entomologist of this Board:

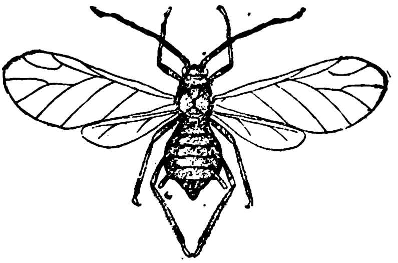


FIG. 7. Peach Aphis.

"It is of a shining black or very dark brown color. The legs are deep brown on the thighs, the tips of the shanks and the tarsi; elsewhere yellowish. The cornicles or honey tubes are quite long, moderately slender and of the same color as the body. There is a series of deep pits on each side of the abdomen.

"The wingless form differs in the somewhat stouter body, but is very generally like the winged type in color and general structure. The young are of a faint greenish brown, becoming darker as they grow older, until they are of the typical shining black peculiar to the full-grown specimens. The antennæ of the winged form have the sensory pit extremely developed, every joint beyond the basal knob joints being furnished with them. In the wingless form the antennæ have only the usual single pit on the third long joint and the little group on the whip joint.

"Its life history is as follows: This species is found on the roots of the trees throughout the year and it breeds there quite undisturbed. Early in spring, or when the leaf-shoots begin to start, it makes its way to the surface and to the branches. Here the winged form develops and then makes its way to new quarters, founding new colonies wherever it reaches, and these about midsummer make their way to the ground and to the roots. Usually some few specimens are to be found on the leaves throughout the summer, but they are much more abundant in the spring. No males of this species have been observed, and no eggs have been found."

When trees are badly attacked by this aphis the leaves are yellowish, more or less curled, and spotted with fungus. Bulletin No. 48, of the Maryland Agricultural Station, recommends: "Where the insect is found on old trees it is best to cut out the infested twigs and burn them. It is readily killed with kerosene emulsion or whale-oil soap, but it must be borne in mind that the black or brownish lice are more resistant to the sprays than the green species. The sprays must therefore be used in stronger solution. Kerosene emulsion diluted ten or twelve times with water and one pound of whale-oil soap in six gallons of water would serve to accomplish the result. When the pest gains a foothold in a nursery, the most satisfactory method is to dig up the stock and burn it."

THE PLUM AND CHERRY APHIS (*Myzus cerasi*).

This aphis closely resembles the peach aphis in general coloring and shape. It appears as soon as the leaves of the trees on which it feeds expand, and multiplies very rapidly, being hatched from eggs deposited on the branches the previous fall. They are not so abundant in midsummer, but become numerous again in the autumn, when the sexes appear and the eggs are laid at the base of the buds and in cracks of the bark, where they remain during the winter and hatch the following spring. They sometimes crowd together in such dense masses that they stand two deep, with just sufficient space between them to enable each individual to insert its beak into the leaf, and before long they completely cover the leaf-stalks, stems, and green berries. They secrete a large amount of honey-dew, which attracts numerous flies, etc. They are subject to the attacks of many lice-destroying insects, which cause immense destruction among them, the trees being nearly cleared of them, but they reappear again later in the season on the terminal leaves. The remedies applied for other species of aphids will be found effective against this one.

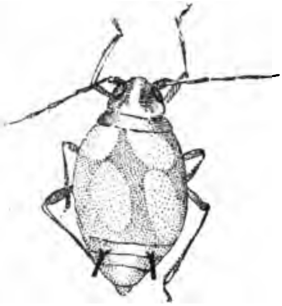


FIG. 8. Plum Aphis.

There are many other species of aphis affecting gardens. Rose bushes are often attacked by a green species, which literally covers the young growth of stems at the ends of branches and the peduncles of the buds, giving the plants a disgusting appearance and injuring them by withdrawing the sap and spoiling the flowers. They may be destroyed by the use of kerosene emulsion, whale-oil soap water, or a decoction of tobacco. These, however, will injure the appearance of the plants. An equally effective means is to remove them by playing a strong stream of water from the garden hose on the infested portions of the plants, which washes the lice from the bushes. If they are knocked from the plants while the beak is inserted in it, and the smallest portion of the tip is broken off, it will prevent them from feeding and necessarily prove fatal to them.

Chrysanthemums are also attacked in the early summer by a species of black aphis, which crowd in immense swarms on the stalks and leaves, greatly to the injury of the plants. Carnations are also subject to the attacks of aphis, which, with the rust which also appears in the summer time, so injures the plants as to prevent the proper development of the flowers. These can be removed or destroyed by the remedies recommended for other species of lice.

Plant lice have many natural enemies which aid greatly in keeping them in check. In fact, without their aid all the efforts of man to prevent the destruction of his plants would prove unavailing. Among the most active in this warfare are the parasitic flies, which are mostly very small and with four transparent wings. They lay a single egg on a louse, which hatches and produces a maggot in the interior of the host, and which feeds on the juices of the louse until it changes to a pupa, from which it emerges through a small hole cut in the body of the louse. A close inspection of a family of plant lice will disclose many with this hole in them. A parasitized louse may be told, even before its death, by the swollen abdomen, which will distinguish it from its non-parasitized mates.

One of the most numerous of the predaceous insects is the Syrphus, or flower flies, which may be seen hovering around flowers, remaining for a short time stationary in the air. They bear some resemblance to a yellow-jacket, with broad yellow bands across the abdomen. They are called "angels" by some children. The fly in its mature state is of no economic importance. The larvæ, however, are very destructive of plant lice. The parent fly lays a single egg among a family of lice, which hatches in a few days and immediately commences its work of destruction. It seizes a louse, and holding it aloft while it kicks and struggles, sucks the juices from its body and then casts the empty skin away. These maggots are blind and have no distinct feet, but they have no trouble in finding a louse by extending the segments of the body, which enable them to nearly double their length, and to strike here and there until they find their prey.

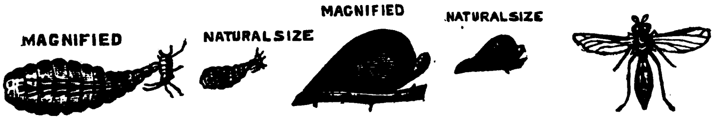


FIG. 9. Syrphus Fly—Pupa and Larva.

The "lady-bugs," or "lady-birds," are also important factors in the destruction of aphis, both as adults and larvæ; but as they consume the entire louse they can not compare with the larvæ of the Syrphus flies in the speedy disposal of aphis. By actual observation a Syrphus fly larva disposed of five lice while the larva of a lady-bug was consuming one. The young of the lady-bird resemble minute alligators in appearance, and are brightly colored and very active in searching for colonies of lice. The mature lady-bird also devours great quantities of lice, but is not as voracious as the larva. The larvæ, when fully grown, coil up into little balls, attaching themselves to a leaf or other convenient place, change to pupæ, and in about eight or ten days to beetles. These live during the winter in crevices of trees or boards or wherever they can find shelter; they emerge in the spring and lay eggs, generally on leaves, the yellow egg, a long oval, standing on end in groups of about twenty, which hatches in about ten days if the weather is warm and favorable. It would be wise for the farmers and horticulturists to provide harbors of refuge for lady-birds during the winter, in order that the greatest number may survive and be ready to attack the aphis while they are few in numbers, and not be compelled to await the hatching of a second brood of beetles before their numbers become sufficiently great to check the aphis, which increase too rapidly for the few over-wintering lady-birds. This shelter could be easily and effectively provided by placing or nailing inverted corn husks in trees and plants, in the protection of which the lady-birds could safely pass the winter protected against cold and rain by the husks, which would readily shed the water.

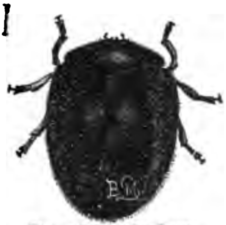


FIG. 10. Lady-Bug.

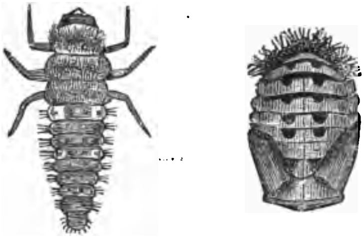


FIG. 11. Lady-Bug—Pupa and Larva.

The "lace-wing flies," or "golden-eyed flies" (*Chrysopa californica*), as they are often called, lend great assistance to the farmers by destroying, in immense numbers, aphids of all varieties. They are the most efficient, according to number, of all the predaceous insects. In the adult stage, they feed very little, or not at all. They are beautiful but fragile-looking insects, of a pale green color, the wings being finely reticulated, with long antennæ and prominent bright, yellowish-brown eyes. When handled they are easily crushed, and emit a peculiar, sickening odor. The larvæ will readily attack any insect which they can overcome, even becoming cannibals when two chance to meet, and are considered injurious in some parts of this State, because they attack and devour the larvæ of lady-birds.

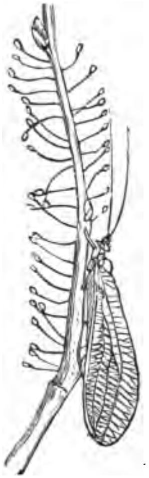


FIG. 12. Lace-Wing Fly, at rest, and eggs.

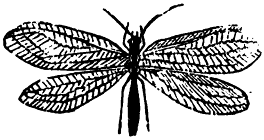


FIG. 13. Lace-Wing Fly, wings expanded.

The following interesting life history is given in Smith's Economic Entomology: "The female in ovipositing touches the end of the abdomen to the surface—usually a leaf—upon which the eggs are to be laid, and elevates her body about a quarter of an inch, emitting at the same time a viscid thread, which hardens on exposure to the air. At the tip of this the egg is fastened, and we thus get a little grove of eggs on stilts. This is supposed to protect them from wandering, predaceous forms that might otherwise feed upon them. When the larva hatches it climbs down the slender thread and attacks and feeds upon the first suitable specimen it can find, usually a young plant louse. Now there is another peculiarity: it does not chew or tear its prey, but holds it firmly, sucking the juices by means of grooves on the inner side of the large mandibles, which are closed by the slender maxillæ. The larva grows rapidly, becoming rather more than a quarter of an inch in length, narrow, spindle-shaped, pointed at the anal extremity, the head distinct and with prominent sickle-shaped mandibles. When full grown it spins, by means of anal glands, a perfectly spherical, white silken cocoon of very dense texture and small in proportion to the larva. It resembles a moderate sized pearl in form and appearance, and when the adult is ready to emerge a circular lid is lifted off to give the matured pupa exit. Comparing the fully developed insect with the cocoon from which it issued, the marvel is great that it was ever packed away in so small a space."

The phylloxera, so destructive to grapevines, belongs to the family of plant lice, but it has been so often described that we will not attempt to repeat it.

THE ARMY-WORM.

(*Leucania unipuncta.*)

Complaints reached this office, in the later spring and early summer months, of depredations done by army-worms, several swarms of which had appeared and in unusually large numbers. One of these swarms was especially bad in Tulare County, and in writing of them, Mr. P. J. S. Montgomery, manager of the Paige orchard and vineyard, states that "they did much damage before we were able to get entirely rid of them, denuding the vines of all foliage, leaving the first crop exposed to the sun, which naturally blistered and was lost. We made a hard fight, however, and exterminated them entirely with the loss of crop on about twenty acres of vines. We used a strong Paris green spray, which was in a measure effective. Those not killed by the spray were destroyed by hand labor, using a gang of men to level the earth carefully, dissolving all clods, making the ground perfectly level, then shaking the worms off and killing them with paddles. Only a light shake was necessary to throw them from the vines. Had we not adopted this plan our entire vineyard might have been badly damaged."

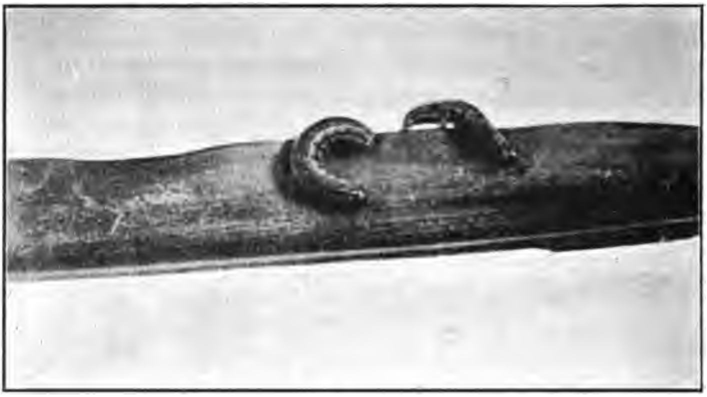


FIG. 1. Two Army-Worms. (From photograph by New York Experiment Station.)

Fortunately such outbreaks are not of frequent occurrence and never appear for two consecutive seasons in the same locality. As occasional outbreaks have occurred many times in the past and in different parts of the State, a sketch of the life and habits of the army-worm will, therefore, be of value to our fruit-growers and farmers. The bands so far reported in our State are comparatively small and usually confined to a few acres in extent, while in the East the swarms sometimes cover many miles. The moth which produces them is a night-flier, and the caterpillars burrow under the ground during the daytime. So they may exist by millions in a small area and their presence escape notice until, having exhausted the food-supply of their breeding-grounds, they take up the line of march for new pastures.

The following extracts are from a bulletin by Clarence M. Weed, published by the New Hampshire Experiment Station, and the illustrations by M. V. Slingerland in Cornell University Bulletin No. 133:

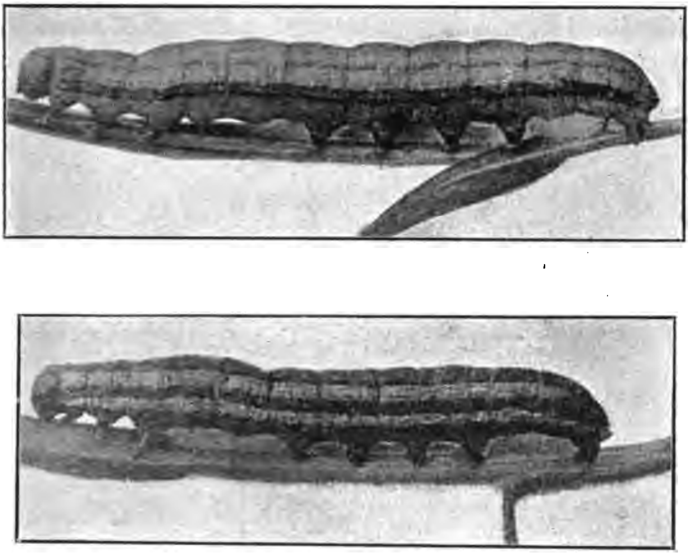


FIG. 2. Light and Dark Varieties of the Army-Worm; greatly enlarged.

"*The Life of the Army-Worm.*—The story of the life of the individual army-worm may be briefly told. On some summer night there appears in the meadow a good-sized, light-brown moth. Flying about she finds a cluster of strong-growing grass. Into the folded leaves of one or more of these she pushes a number of small whitish eggs, gluing them in rows of a dozen or more. A week or ten days later each egg hatches into a minute, whitish worm, that nibbles at the grass blades at night and in the daytime hides beneath the grass from the rays of the sweltering sun. It grows rapidly in size. At the end of a week it molts or casts its skin, a process in which the old skin splits open along the back and the worm crawls out, clothed in a new skin that had developed beneath the old one. Again it feeds as before, its voracity increasing with its size. This molting is repeated four or five times during the month after the worms hatch, so that by the end of this period the insect is an inch and a half long, and has the familiar markings of the full-grown army-worm.

"The instinct of the worm now teaches it to seek more secure shelter for the helpless stage upon which it is about to enter. It burrows into the soil an inch or less and wriggles about in the earth until it produces a hollow cell. In this it casts its skin again and becomes a pupa—the third stage of its existence. When the worms are very abundant, many of them do not go into the ground, but change to pupæ beneath whatever shelter may be at hand. About a fortnight later, another change takes place, and the fully-developed moth emerges from the pupa, thus completing the round of the insect's life. The moths fly toward dusk and at night, and by means of their long tongues, coiled up when not in use, they suck the nectar of various flowers.

"The moths sometimes seem attracted by buildings. I have been told of their swarming toward the close of cloudy afternoons about barns and outbuildings.

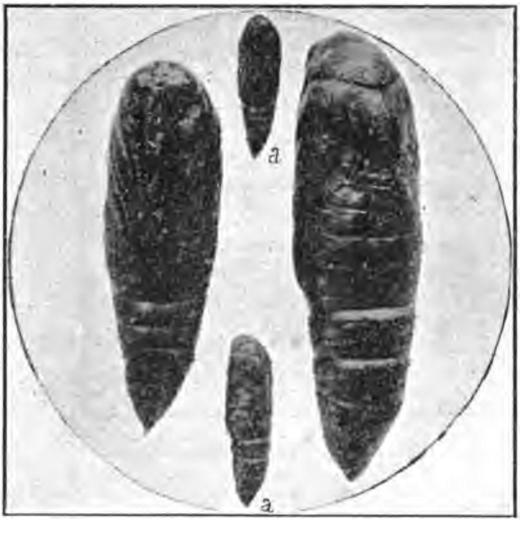


FIG. 3. Pupa into which the army-worm transforms; natural size at *a*.

"*The Army Habit.*—During ordinary years the army-worm is present in most of the regions where its outbreaks occur, individual worms feeding here and there in meadows and pasture lands, but the number is not sufficient to attract notice. At such times their habits of life are very similar to those of the common cutworms, to which, indeed, the army-worms are closely related. It is only when these insects become so excessively numerous that they exhaust the food-supply of the field in which they develop, that the 'army' habit is assumed. Then, however, they are forced to seek new quarters for food, and as their only mode of progress is by crawling along the ground, they move in solid masses toward adjacent fields. 'Their numbers at these times,' wrote Dr. C. V. Riley, 'are often so enormous, and their voracity so great, that it is impossible for one who has not been an eyewitness to appreciate it fully. * * * The army-worm when traveling will scarcely turn aside for anything but water, and even shallow watercourses will not always check its progress, for the advance columns will often continue to rush headlong into the water until they have sufficiently choked it up with their dead and dying bodies to enable the rear guard to cross safely over. I have noticed that after crossing a bare field or road where they are subjected to the sun's rays, they would congregate in immense numbers under the first shade they reached. In one instance I recollect their collecting and covering the ground five or six deep all along the shady side of a fence for about a mile, while scarcely one was seen to cross on the sunny side of the same fence.' This avoidance of the sunshine must have been noticed by every observer of army-worm outbreaks. On damp, cloudy days one may find numbers of them feeding near the top of grass and grain stalks, but on hot, sunny days few, if any, are to be found in such situations. They then occur in the shaded rubbish at the soil surface.

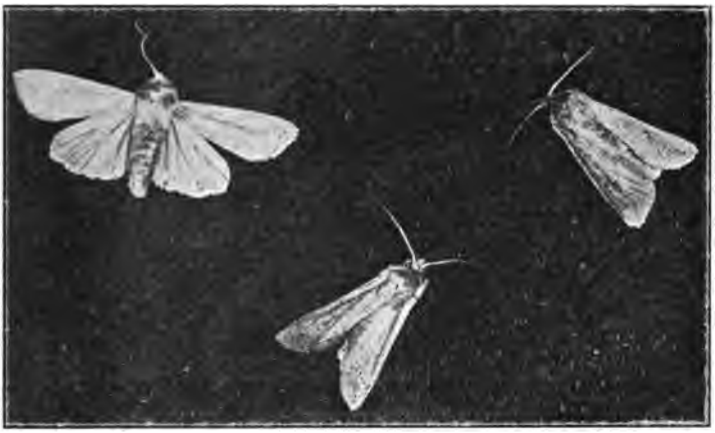


FIG. 4. Moths of Army-Worms; natural size.

"*The Choice of Food.*—The army-worm feeds by preference upon plants of the great grass family, which includes both the grasses and grains. The moths are especially attracted, for the deposit of their eggs, to rank growths of grass-like plants. In feeding upon timothy and similar grasses the leaves are first stripped, and in cases of severe attacks the heads will be wholly or partially gnawed off. They also feed freely upon the leaves and more or less upon the succulent stalks of wheat, oats, barley, rye, sorghum, and Indian corn. Generally they feed upon clover only when driven to it by hunger.

"*The Life-stages of the Insect Described.*—The egg of the army-worm moth is a tiny whitish sphere with a diameter of only about one fiftieth of an inch. When first deposited it is dull and opaque, but soon afterward it becomes shiny and more or less iridescent. Just before hatching it appears much darker. The spherical outline in many specimens is changed by the sticky material attached to them at the time the eggs are deposited.

"The larva when full-grown is of the form represented in Fig. 5, *c*. It is a smooth, cutworm-like caterpillar, an inch and a half long, generally of a dark gray or dingy black color, 'with three narrow yellowish stripes above, and a broader one or slightly darker on each side, thinly clothed with short hairs (to be seen with a lens), which are longer and somewhat thicker on and about the head. The latter is of a polished honey-yellow color, with a network of fine dark brown lines and a black line on the front, like the letter V reversed.' The size of the mature worm varies considerably, some specimens reaching a length of two inches.

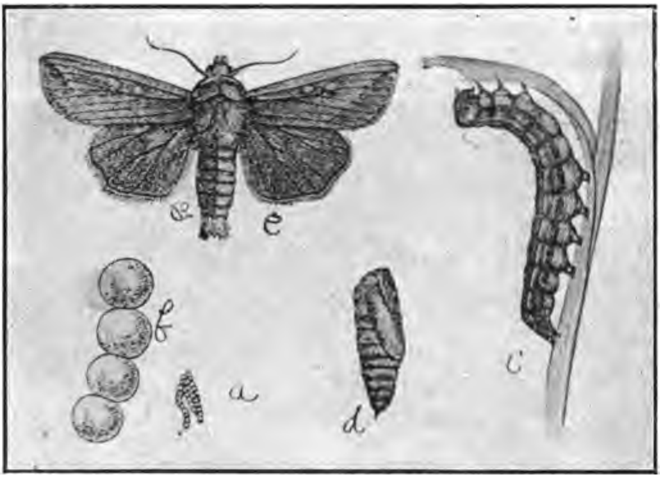


FIG. 5. THE ARMY-WORM. (After Riley.)
(*a*) Egg-mass, natural size; (*b*) Eggs, magnified; (*c*) Full-grown larva; (*d*) Pupa; (*e*) Moth.

"The pupa into which the full-grown army-worm changes before it can become a moth is represented in Fig. 5, *d*. It is a quiet, footless, wingless object, of a bright mahogany-brown color, and measures about three fourths of an inch in length. At the smaller end there are two pointed projections side by side, and near the base of each projection is a smaller, more slender spine with a hooked tip.

"The adult moth into which the army-worm develops, and from the eggs of which it originates, is represented, natural size, in Figs. 4 and 5, *e*. Its expanded wings measure about an inch and a half from tip to tip, although there is considerable variation in the size of different specimens. The general color of the body and front wings is a peculiar reddish-gray, perhaps more distinctly described as fawn color. Near the middle of each front wing are two more or less irregular lighter patches, each of which on closer study is seen to be made up of three smaller spots. Along the side margins of both pairs of wings there is a fringe of feathery scales, immediately inside of which, on each of the front wings, is a row of blackish dots. The hind wings are more grayish, with less of the reddish tinge.

"*The Army-Worm's Enemies.*—Fortunately for the American farmer, the army-worm has a host of natural enemies, which generally keep it below the danger line. A large number of birds consider the juicy worms excellent eating, and feed freely upon them. A list of such birds would include nearly all of our native insectivorous species that search for food upon the ground, but special mention should be made of the robin, the blackbird, the bobolink, and the meadowlark, which search grass-lands for insect larvæ more persistently than many other of our common birds. These and other birds are very useful in keeping army-worms and cutworms in check, and should be encouraged by every one.

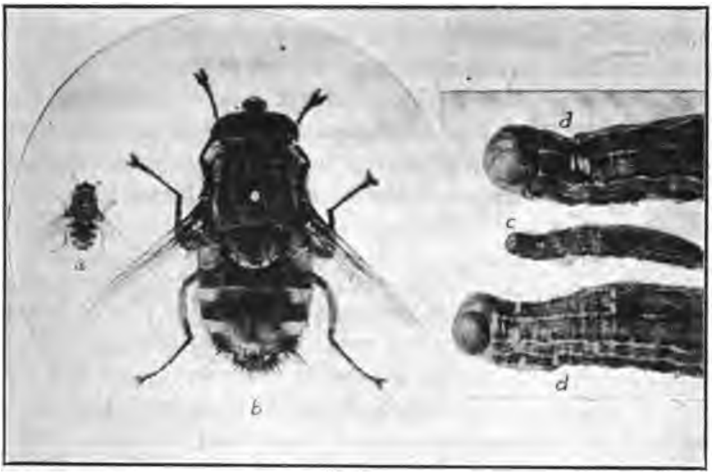


FIG. 6. THE RED-TAILED TACHINA FLY (*Winthemia 4-pustulata*).
(*a*) Fly, natural size; (*b*) Fly, much enlarged; (*c*) Army-worm upon which the fly has laid eggs, natural size; (*d*) Parasitized army-worms, enlarged.

"But the birds are not the only enemies of the army-worm. In the fields where the pest has been present this season there have also been found a great many large black beetles. During July I examined a barley field in which the grain had recently been cut and placed in piles, beneath which the army-worms had congregated in great numbers. There were also present beneath each pile about a dozen of these black beetles, devouring the helpless worms. These predaceous beetles are commonly called ground beetles, because of their habit of living upon the ground, but sometimes they are also called caterpillar hunters.

"There are also many species of internal parasites that prey upon the army-worms. Among the most abundant of these are certain two-winged flies that glue eggs upon the backs of the worms. The eggs hatch into tiny footless maggots, that enter the bodies of the worms when they hatch, and develop inside at the expense of their unwilling hosts. Finally they kill the worms and the maggots change to pupæ, from which they soon emerge as flies. These are called Tachina flies.

"There are several species of four-winged Ichneumon flies that have a similar history, and are often very destructive to the hosts of army-worms.

"The larger ground spiders also feed freely upon these worms; and the moths are often entrapped in the webs of the spinning spiders.

"More fateful and insidious even than these other enemies, are the microscopic germs of a bacterial disease—a sort of insect cholera—that often attacks the army-worm when it becomes over-abundant, reducing quickly its invading ranks to below the normal level.

"To the action of these various natural checks is doubtless due the seemingly strange appearance and disappearance of this vexatious pest. Nature strives ever to keep a balance in her affairs, and when an insect becomes too abundant, she marshals her various forces to bring it into subjection.

"*Remedial and Preventive Measures.*—When an outbreak of army-worms is first noticed, if it is confined to a limited area it is generally well worth while to cut down the grass or grain infested. The worms will remain beneath its shelter for two or three days, and as soon as the cut grass or grain is dry enough it should be burned, thus destroying the pests and preventing the invasion of neighboring fields. The worms may also be destroyed by spraying them with strong kerosene emulsion. This is prepared by adding two gallons of kerosene to one gallon of a solution made by dissolving one half pound of hard soap in one gallon of boiling water, and churning the mixture by forcing it back into the same vessel through a force-pump with a rather small nozzle, until the whole forms a creamy mass, which will thicken into a jelly-like substance on cooling. The soap solution should be hot when the kerosene is added, but of course must not be near a fire. The emulsion thus made is to be diluted, before using against the army-worm, with five or six parts of water to one part of emulsion. The amount of dilution varies with different insects. Soft water or rain water should be used in diluting. If this can not be obtained add a little lye or bicarbonate of soda. It should be applied with a spray pump or nozzle.

"The device of stopping the armies of traveling worms by means of ditches and trenches occurred to the earliest sufferers from their depredations. In the New Hampshire outbreak of 1770, Mr. Powers tells us that the inhabitants 'dug trenches around their fields a foot and a half deep, hoping this might prove a defense; but they soon filled the ditch, and the millions that were in the rear went over on the backs of their fellows in the trench and took possession of the interdicted food. The inhabitants then adopted another expedient to save those fields yet standing. They cut a trench as before; then took round and smooth sapling sticks, of six or eight inches diameter and six or eight feet in length, sharpened them to a point, and with these made holes in the bottom of the ditch, once in two or three feet; and as their meadows were bottom lands, they experienced no difficulty in extending these holes to two or three feet in depth below the bottom of the trench. The sides of these holes were made smooth by the bar or lever which made the holes, and as soon as the worm stepped from the precipice he ended at the bottom, and could not ascend again; indeed, he was soon buried by his unfortunate fellows who succeeded him in his downfall. Now those who made these holes to entrap their invaders went around their fields and plunged these pointed levers into the holes filled with worms, and destroyed every one of them at a single thrust.' Similar methods of fencing off the worms have often been employed to good advantage since. The side of the furrow or trench next the field to be protected should incline obliquely so that the upper part will be nearer the side toward the worms than the lower part, thus rendering its ascent more difficult. In cases where holes are not dug in the bottom of the trench to trap the worms, they may be killed by dragging boards or small logs along, or by strewing the trench with straw from time to time and then burning it.

"Some years ago Dr. C. V. Riley wrote: 'From experiments which I have made, I am satisfied that where fence lumber can be easily obtained it may be used to advantage as a substitute for the ditch or trench by being secured on edge and then smeared with kerosene or coal tar (the latter being more particularly useful) along the upper edge. By means of laths and a few nails the boards may be so secured that they will slightly slope away from the field to be protected. Such a barrier will prove effectual where the worms are not too persistent or numerous. When they are excessively abundant they will need to be watched and occasionally dosed with kerosene to prevent their piling up even with the top of the board and thus bridging the barrier. The lumber is not injured for other purposes subsequently.'

"One of the simplest ways of preventing injury by the army-worm, where it can be done without danger to livestock, is that of dusting or spraying with poison a strip of grass or grain in advance of invaders. The simplest way of doing this would be to apply Paris green, when the dew is on in the morning, by means of one of the insecticide bellows now upon the market, designed more especially for use against the potato beetle. The poison can be applied to a strip of grass by the spray-pump or nozzle, or even from a watering-pot, but this is an unsatisfactory way, because the grass-blades do not hold the spray. It would probably be better to dust the poison from a bag on the end of a pole. Cattle should not be allowed in the field so treated until there has been plenty of time for the rains to wash the poison into the soil.

"There is probably no general method that can be used more effectively for destroying army-worms than that of burning-over, in autumn or early spring, grasslands in which the worms are present. As already indicated, a portion of the pests appear to go through the winter as partly-grown worms. Consequently it seems well worth while to examine carefully fields in which they are likely to be present, and burn them over as thoroughly as is possible. Where it can easily be done, this burning is also advisable as a preventive measure, even in regions where the worm has not been destructive this year. The burning should also include old rubbish heaps and such worthless miscellaneous materials as may serve as a hiding-place for this and other injurious insects, either in the larval or moth stages."

THE CANKER-WORM.

(*Paleacrita vernata*, Riley. *Alsophila pometaria.*)

This insect has been reported from several parts of the State during the summer, but not in great quantities, nor has it done serious damage. The most serious reports come from the Pajaro Valley, and, writing from there, Mr. C. H. Rodgers says: "In regard to the damage done by the 'measuring-worm' in this section this season, will say that there was no material loss to the orchardist on account of this pest. As yet it is confined to a few small areas scattered here and there through the valley. It seems to thrive only on heavy loam or adobe soils, and is rarely seen on trees growing on sandy soil. The egg-laying season here does not correspond with the time as laid down in Bulletin No. 71, page 11. This bulletin states that the eggs are laid during November and December throughout California, and I have watched the progress of egg-laying very carefully during the past winter and spring. The first canker-worm eggs I discovered on January 28th. In February I found a few, but most of the eggs were deposited during the month of March, and the great majority were deposited during the last part of the month. Many eggs were deposited in the early part of April. I found freshly-deposited eggs up to April 10th. I am not mistaken in the assertions I make, because I had certain trees in my own orchard under observation and studied the matter closely. The remedy which gave best satisfaction here was 'banding' the tree with heavy paper, smearing the paper with equal parts of coal tar and molasses, and shaking the insects off the tree. In attempting to crawl up the tree the insects became entangled in the sticky material and perished. Paris green, 1 pound to 200 gallons, did not have the desired effect. Wire netting, as recommended in Bulletin No. 71, has not been tried, but I propose to adopt this plan this coming season."

As there are two forms of canker-worm, which resemble each other very strongly in their markings and habits—the spring canker-worm (*Paleacrita vernata*, Riley) and the fall canker-worm (*Alsophila pometaria*)—our correspondent, while correct in his observations, may not be correct in all his conclusions.

The canker-worms belong to the order Lepidoptera, super-family Geometrina, and are commonly known as measuring-worms, loopers, or, as sometimes called, inch-worms, from their peculiar way of walking.

They sometimes appear in very large numbers in secluded localities, and are then among the more important of our insect pests, often entirely defoliating shade and fruit trees in the section infested by them. There are, as above stated, two entirely distinct species of canker-worms, and they resemble each other so closely that they were long regarded as the same insect, and even now it requires a trained entomologist to distinguish one from the other. In their larval form both are loopers, or measuring-worms; in both, the adult male is provided with wings, while the female is wingless. In the one species the greater part of the moths appear in the fall months, going through their changes and emerging at this season; while in the other species they remain in the pupa state during the winter months and make their appearance as moths in the spring. The two species are, therefore, commonly designated as the fall canker-worm and the spring canker-worm.

The female spring canker-worm (*Paleacrita vernata*) deposits her eggs early in the spring, and the young caterpillars, as soon as hatched, commence to feed upon the new foliage. The larvæ continue to feed for four or five weeks, when, having attained their full growth, they enter the ground and pass through the pupa state.

The female fall canker-worm (*Alsophila pometaria*) deposits her eggs during November, December, and in the early part of January, and these hatch about the time the trees put forth their leaves. The larvæ attain their growth in four or five weeks, when they descend to the ground, into which they burrow for a depth of several inches; here the caterpillar forms a small cell, in which it passes the pupa state, and emerges a full-grown moth.

Comstock describes the two species, as follows:

"*The Spring Canker-Worm* (*Paleacrita vernata*).—The eggs are ovoid in shape, and are secreted in irregular masses, usually under loose scales of bark or between the leaflets of the expanding buds. The larvæ hatch about the time the trees expand, and become full grown in from three to four weeks. They vary greatly in color, and are marked on the back with eight narrow, pale, longitudinal lines, which are barely discernible; the two lateral lines of each side are much farther apart than the others; and there are no prolegs on the fifth abdominal segment. The pupa state is passed below the surface of the ground in a simple earthen cell, which is lined with very few silken threads. The adult moths usually emerge early in the spring before the leaves expand; but they

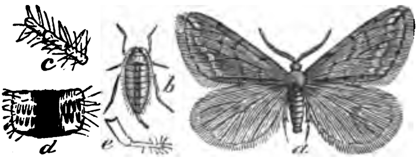


FIG. 1.

SPRING CANKER-WORM (*Paleacrita vernata*).

(*a*) Male moth.
(*b*) Female moth.
(*c*) Three joints of antennæ of female moth.
(*d*) Abdominal segment of female moth; enlarged.
(*e*) Ovipository; enlarged.

sometimes appear late in the fall, or on the warm days during the winter when the ground is thawed. In both sexes the adult of this species is distinguished by the presence of two transverse rows of stiff, reddish spines, pointing backward, on each of the first seven abdominal segments.

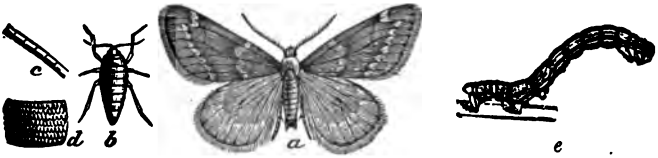


FIG. 2. FALL CANKER-WORM (*Alsophila pometaria*).
(*a*) Male moth. (*b*) Female moth. (*c*) Joints of female antennæ; enlarged.
(*d*) Segment of body of female; enlarged. (*e*) Larva of canker-worm.

"*The Fall Canker-Worm* (*Alsophila pometaria*).—The eggs appear as though cut off at the top, and have a central puncture and a brown circle near the border of the disk. They are laid side by side in regular rows and compact batches, and are generally exposed. They hatch in the spring at the time the leaves appear; and the larvæ mature in about three weeks. The larvæ is of a pale, brownish color marked with dark brown and yellow; the body is marked on the back with six broad and very distinct pale lines, those of each side equidistant; and there is a pair of distinct prolegs on the fifth abdominal segment. As in the preceding species, the pupa state is passed beneath the ground, but this species makes a perfect cocoon of fine densely-spun silk. The adult moth usually emerges in the fall, generally beginning about the middle or latter part of October; although a considerable number come out of the earth in the winter during warm weather and in the spring. The moths of both sexes lack the abdominal spines characteristic of the spring canker-worm."

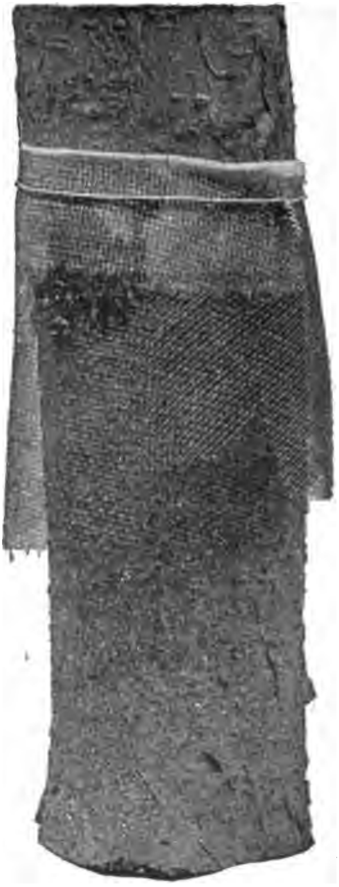


FIG. 3. Canker-Worm Moth Trap.

Remedies.—The two species of canker-worm are so much alike in their habits that the same remedies will do for both.

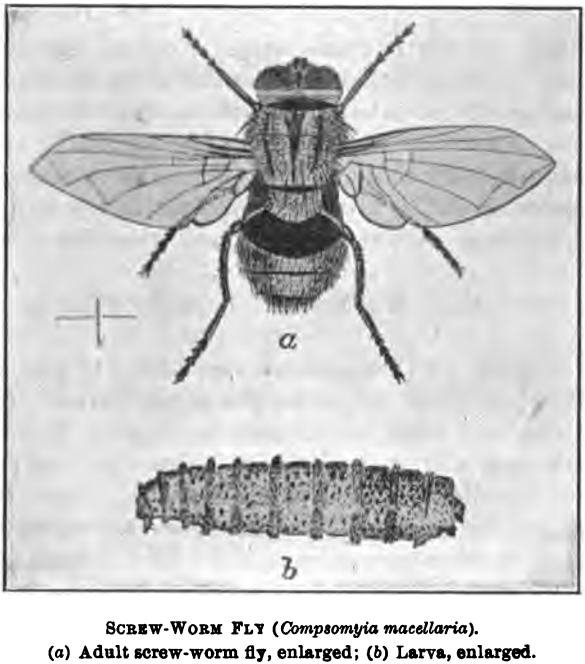
The wingless female moths should be prevented from climbing the trees to deposit their eggs in the fall. This can be done by placing a wire netting trap, as shown in Fig. 3. First place around the tree a piece of cotton batting, and then a strip of wire netting of No. 16 mesh, six or eight inches wide. Tie at top with cord or wire. See that the netting does not touch the tree at bottom. The insects will collect under it and go up as far as they can, being attracted by the light through the netting, and there perish. After the female has ceased crawling or hatching, the traps should be removed and scalded, as eggs deposited on them will hatch and the minute larvæ will get through the mesh. The trunks of the trees below the trap should also be scrubbed or coated with a thick whitewash.

Remedy against the Larva.—Spray the infested trees with one pound of Paris green to 200 gallons of cold water. To prevent the Paris green from injuring the leaves dissolve six pounds of fresh lime in water and add the latter to the solution. Keep the mixture *constantly stirred* while spraying.

THE SCREW-WORM FLY.

(*Compsomyia macellaria.*)

A couple of years ago consternation was caused in some portions of the San Joaquin Valley by the appearance of the screw-worm fly. It was probably imported from Texas, Arizona, or New Mexico, either in the larval state on cattle brought from those States, or in the pupal state or perfect fly in the railroad cars. While the damage reported from it was not great, yet the dread of its attack kept timid people in a state of alarm. It is said to occur in a large portion of the American continent, but is generally confined to the tropical or sub-tropical regions.



SCREW-WORM FLY (*Compsomyia macellaria*).
(*a*) Adult screw-worm fly, enlarged; (*b*) Larva, enlarged.
(After Francis.)

Professor Smith, in Economic Entomology, gives the following description of this fly:

"A somewhat smaller species than the blow-fly, of a very much brighter green or bluish color, with four longitudinal lines on the thorax, is the screw-worm fly (*Lucilia macellaria*). This is a common species throughout a large portion of our country, and ordinarily feeds upon dead or decaying animal matter. Under some circumstances, however, it attacks living animals, and in the Southern and Southwestern States occasionally becomes a terrible pest. On such occasions it lays its eggs on man or animals wherever there is the slightest trace of a wound, bruise, or offensive discharge of any kind. The larvæ bore directly into the living flesh, causing intense pain as well as suppurating sores. Living larvæ are produced as well as eggs almost ready to hatch, and in any opening from which there is a discharge of any kind eggs may be deposited. Sleeping humans with an offensive breath, or with a fetid discharge from the nostrils or mouth, have had eggs laid at these points, and larvæ have made their way into the head in some cases, causing the death of the individual. Eggs have also been laid in the ears of uncleanly people, and the channels and passages of this organ have been penetrated into the head and destroyed. Animals are troubled in the same way, and where the insects are abundant their attacks often become fatal. The only remedy is cleanliness. Wounds, even of the most trifling nature, on cattle should be smeared with an antiseptic ointment. As far as possible all materials in which the flies can breed should be destroyed; no accumulation of animal refuse should be allowed under any circumstances, and by strictest attention to surroundings, the breeding of the insects should be prevented. Attacking live animals is not a usual habit, although very readily assumed when the insects become abundant."

Professor Comstock, in his Manual of the Study of Insects, has the following:

"The screw-worm fly (*Compsomyia macellaria*) is a bright metallic green fly, with four black stripes on the upper part of the thorax; it measures about one third of an inch in length. This terrible pest resembles the flesh flies in habits, and it deposits its eggs in wounds, sores, and the nostrils and ears of men and cattle. The larvæ living in these situations often cause serious sickness and sometimes even death."

Several cases of death have been reported from the attacks of this fly. It is only the larva which acts as a parasite. In Texas it is a common parasite on animals, in which the fly deposits its eggs in wounds caused by dehorning, castration, barbed-wire cuts, etc., and in the horse they may be deposited in the sheath. The larvæ bury themselves deeply in the tissues, causing the formation of abscesses, and are difficult to dislodge. The fly is said to be capable of depositing several hundred eggs in a very short time. The larvæ mature in about a week and enter the ground to pupate, which they complete in from nine to twelve days.

The remedies recommended are the use of mosquito netting and protecting the mouth and nostrils while sleeping in the open air. When the larvæ have gained an entrance to the tissue the use of carbolic acid (one part to two hundred parts of water), creolin (full strength), and turpentine, applied with a syringe, has been found the most effectual. Professor Osborn recommends prompt treatment with washes of dilute carbolic acid and subsequent coating with pine tar.

Since the date mentioned in the introduction of this article the fly has apparently disappeared, its extermination probably being caused by the cold winter of the San Joaquin Valley, and it is to be hoped that it will not soon again be imported. However, the above history, description, and remedies are given, in case any section should become afflicted with this terrible pest.

CODLING-MOTH TRAPS.

At different times traps for the capture of the codling-moth have been extensively advertised, with preposterous claims as to the number of codling-moths that have been captured by them, thus inducing farmers to buy them and to waste their time and money for traps and the materials to operate them. The universal report from every competent experimenter who has tested them is that the traps are not only useless for the purposes claimed, but also exceedingly detrimental because of the many beneficial insects which they destroy.

Prof. M. V. Slingerland, Entomologist of Cornell University Experiment Station, issued a bulletin in 1902 giving the results of extensive experiments made at that station, from which we make the following extracts:

"That many kinds of insects are active at night and that some of them are then attracted by any artificial light are old and familiar truths of world-wide application, and in the ceaseless warfare against insect pests many efforts have been made to take advantage of this light-loving habit.

"Recently trap-lanterns have been much discussed as destroyers of insect pests in the northern and western portions of the United States. By the most persistent and often most unscrupulous advertising, a certain 'moth-catcher' has been forced into undue prominence, and thousands of fruit-growers and farmers have been induced to buy them, in spite of the protests of those who have thoroughly and scientifically tested such devices.

"Only those insects that fly about most actively at night are caught, and the peach-tree-borer moth and the house flies are only accidental captures, for they are most active during the day. Trap-lanterns capture only insects that can fly, and can not attract nymphs or larvæ, the stages in which insects do all their destructive work; and none of the wingless female moths, as canker-worms or tussock moths, would deliberately crawl into a trap-lantern. Another very important consideration is that many beneficial insects will be attracted and killed with the injurious ones.

"By far the most important question to consider in discussing trap-lanterns is not how many, but what kinds are caught. When the fruit-grower measures or counts the thousands of pints of insects which are sometimes caught in a trap-lantern it seems to be a valuable aid in his insect warfare and well worth the cost. But a careful inventory will usually tell a different tale, and the number of insect friends or beneficial insects will often equal and may exceed the number classed as enemies. It will be found that comparatively few of the much-desired female insects are caught, and those have already laid their eggs. A very large percentage will be the more active males."

The following is a description of the trap-lanterns used in the experiments at Cornell University:

"It was an ordinary lantern set on a brick in a common tin pan, and these were fastened to a platform on a stake. Water was poured into the pan until the brick was covered, and then enough kerosene, the killing agent, was used to form a thin film on the water. The stake raised the lantern about four feet from the ground. Six trap-lanterns were used in 1889, and were run every night from May 1st to October 1st, involving an immense amount of labor, as each lantern had to be visited twice a day, lanterns filled with oil and lighted, insects collected, and water and oil placed in pans. A single trap-lantern was run in 1892."

Trap-lantern used in the Cornell experiments.

A table was printed giving the total number of insects taken in the trap of 1892, from which we condense as follows: Total number of insects taken, 12,712; different species, over 290; number of decidedly beneficial insects, 1,330; number that are often pests, 1,604; number of neutral or rarely injurious, 9,778. The percentage of decidedly beneficial insects killed nearly equals that of the species which are often pests, and the important fact that one beneficial insect usually kills several injurious ones must be considered. Nearly one half of the captures were moths, but more than three fourths were not of economic interest and *no codling-moths were recognized.* Seventy-nine per cent of the Crambid moths, 88 per cent of the Noctuid moths, 84 per cent of the larger moths, and 93 per cent of the May beetles were males, and these proportions were almost the same in the six trap-lanterns operated in 1889. Furthermore, in most cases the females that were killed had already laid their eggs, so that their capture would not lessen the future crop. It was found that about 80 per cent of the Ichneumon or parasitic flies were females, the ones most needed in insect warfare. The male moths were doubtless seeking their mates, and the female Ichneumon flies were necessarily more active than the males, as they had to find caterpillars in which to oviposit. These facts are strong arguments against the effectiveness of trap-lanterns as destroyers of insect pests.

After citing the experiences of Professor Steadman of Missouri, who had made three different tests of trap-lanterns in three different States; of the late Dr. Riley, who had run a trap-lantern during a whole summer and failed to catch a single codling-moth; of Professor Lochhead, who had two moth-catchers near apple trees in 1901 and failed to take a single codling-moth; of the directors of several Experiment Stations, and of others, Professor Slingerland summarizes as follows:

"Thus the many attempts to capture this 'king of pests' during the past thirty years have resulted in the death of at least eleven codling-moths. The above facts are surely enough to convince any fair-minded orchardist that trap-lanterns or 'moth-catchers' will not attract or capture enough codling-moths in an orchard to pay for even the matches necessary to light them."

Professor Slingerland adds: "In brief, there is as yet no reliable evidence to show that trap-lanterns or 'moth-catchers' will noticeably check any of the common insect pests of orchard fruits, and this is also true of the enemies of small fruits. We believe that one thorough and timely application of a Bordeaux and poison spray to fruit trees will give infinitely better results at much less expense than can be obtained with any number of 'moth-catchers' around every tree. We are convinced that orchardists have no use for trap-lanterns, and that it is, therefore, time and money thrown away to use them."

L. A. Goodman has published a bulletin on moth-traps, citing numerous authorities as to their inefficiency, which corroborates all that Professor Slingerland has stated. Following are the authorities: J. M. Steadman, State Entomologist, Missouri; F. H. Speakman, Neosho, Mo.; E. P. Felt, State Entomologist, New York; Professor Garman, State Entomologist, Kentucky; E. A. Popenoe, State Entomologist, Kansas; S. A. Hoover, Normal, Warrensburg; Prof. J. Troop; S. Bruner, State Entomologist, Nebraska; F. M. Webster, Ohio Agricultural Experiment Station; E. Dwight Sanderson, State Entomologist, Delaware; Dr. L. O. Howard, U. S. Entomologist, Washington, D. C.

A CURIOUS CALIFORNIA JUMPING-GALL.

In the early part of August of the present year a gentleman brought into this office a vial containing numbers of what appeared to be small seeds, about the size of No. 6 shot, which were incessantly in motion. They were found jumping on a garden walk in the suburbs of Sacramento. The gentleman stated that he believed they were the eggs of an insect, and that the jumping was caused by the movements of the embryo therein.

An examination under the microscope proved that the shell was slightly pubescent, cellular in structure, not chitinous, as would have been the shell of an insect, and there was no doubt that the shell was of vegetable structure. Inclosed in the shell was the white larva of an insect. The objects were submitted to several persons, but no satisfactory information could be obtained of what they were, nor an explanation made of their jumping motions.

A few days later the same gentleman again appeared with an oak leaf, on the under side of which were borne a great number of small galls, which, on being removed from the leaf, commenced jumping about in a most lively manner, and proved to be the same kind as he had previously brought.

When a few of these galls were placed on a sheet and isolated so that their movements could be carefully observed, it was noticed that there were intervals of from five to ten seconds between their jumping movements, and that the distance jumped was from one quarter of an inch to one inch.

The writer had for years been familiar with these galls on the under side of oak leaves, which often have a reddish tinge and can readily be seen by any one who looks for them, but had never before seen their movements or heard of them.

On placing a few of the galls on moistened blotting paper, in a very short time they ceased moving, but on being removed to a dry position they again almost immediately commenced jumping, and continued to do so. Reasoning from this experiment, it is probably the object of their jumping to reach some moist spot, where they will remain during their larval and pupal state. The moisture will soften the gall shell, and when the insect has reached its maturity and the time arrives for its emergence it will meet with but slight resistance in its exit from the shell.

Further research showed that these galls were formed by a small hymenopterous insect of the family Cynipidæ; that in August they become detached from the leaves which bear them, and that the jumping is caused by a spasmodic movement within the thin-walled gall cavity. They are commonly known as "flea seeds," probably because they look like a seed and jump like a flea. They are indigenous to California, and are found very plentifully on the white oaks in the vicinity of Sacramento and sparingly on the scrub oaks that grow along the Sacramento River and other streams. The dweller in this gall has a most singular peculiarity. It entirely fills the small gall, which is closed, and in which it passes its larval and pupal state, and therefore, being unable to prevent its cell from becoming foul, nature has not provided an opening in its caudal extremity.

The jumping-beans of Mexico are familiar objects in the curiosity shops of San Francisco and elsewhere. In the interior of this bean is the larva of a small tortricid moth, and when the bean is warmed the movements of the inclosed larva cause the bean to move about on a smooth surface. The jumping-gall of California, however, needs no artificial aid for its movement, and is, we believe, the only gall or seed in California that has ever been known to move without outside aid. As it is of no economic importance, no attempt was made to further study its life history.

The formation of galls is most mysterious, even to the botanist and entomologist. Take, for instance, the ordinary oak ball or apple, as it is sometimes called, so plentiful everywhere in California on the oak trees. It is simply a modified leaf which has been punctured by a gall insect when it deposits its egg; at the same time the gall insect injects a poison, which transforms what would without it have grown to be an ordinary leaf, into a round ball which surrounds the inclosed larva and which has no resemblance to a leaf. If the gall is cut open and carefully examined there can be found and traced the midrib and larger venations of the leaf. In some galls the formation does not commence until the egg has been hatched, which proves that the parent insect did not inject the poison which caused distortion, but that it was caused by the larva itself.

Each variety of gall insect infests certain plants, and a trained entomologist can tell at a glance the species of gall insect which produced the gall. The galls on blackberry bushes are produced by one species, and those on rose bushes, known as "bedegars," are produced by a different variety of gall flies.

Often other species of flies, called guest flies or inguilines, lay their eggs in the galls made by the gall insects, and their larvæ feed upon the juices of the galls without any detriment to the original maker of the galls.

COLLECTION AND PRESERVATION OF INSECTS.

There have been many applications made to this office during the past summer for instructions in the capture, preservation, and mounting of insects. These have come principally from the County Horticultural Commissioners and local inspectors, among whom there is a laudable and growing interest in entomology and an increasing desire to make type collections of the injurious and beneficial insects of their various sections for comparison and exhibition. Very many of our Horticultural Commissioners have creditable collections on exhibition in their offices, and they have found this very useful as an educational means of impressing upon the fruit-grower the necessity and methods of combating the destructive species and of protecting those that are beneficial. In answer to these requests, the following paper on the collection and preservation of insects is presented:

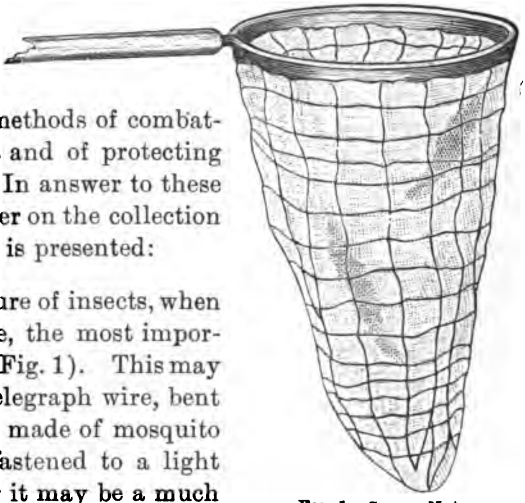


FIG. 1. Sweep Net.

Insect Nets.—In the capture of insects, when they reach the winged stage, the most important instrument is the net (Fig. 1). This may be made with a piece of telegraph wire, bent into a ring, to which a bag made of mosquito netting is attached, and fastened to a light wooden handle (Fig. 2), or it may be a much more elaborate affair, made to fold up and carry in the pocket when not in use. Its principal requisite is lightness, in order that it may be ready to throw over the insect it is desired to catch. The simplest form of the net, which can be made by almost anybody, is constructed as follows: A rod, not over five feet in length, of some light material, preferably bamboo, for a handle; a loop or ring of metal, or of some moderately stiff but flexible material, is attached to the handle; upon this a bag of fine netting, tarletan being the best material, should be sewed. The bag should be not less than eighteen inches deep and the ring not under a foot in diameter. More elaborate nets can be obtained from dealers in entomological supplies, but the average collector can make his own net with the exercise of a little ingenuity and the expenditure of a few cents for material. The net should be made of some gray or green material, as white is more likely to startle the insects and to cause them to fly when the collector is ready to throw it over them.

A heavier and a stronger form of net is required sometimes when it is desired to capture aquatic insects, or for beating low-growing shrubs, or grass. This is represented in Fig. 3.

The net must be swung swiftly to be successful. Insects have many eyes, are very wide awake, and have no desire to be caught; therefore, the collector must be very active if he gets anything. One method of using the net is called "sweeping"; to do this, take the handle about a foot and a half above the ring and pass the net quickly back and forth, striking it against the grass in front of you as you walk through open fields; the net must be turned at each stroke and kept in rapid motion, or the insects will escape. After a time the net should be examined and the insects put in the killing bottle.

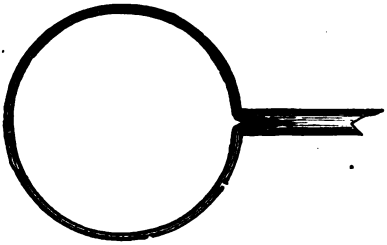


FIG. 2. Framework of Net.

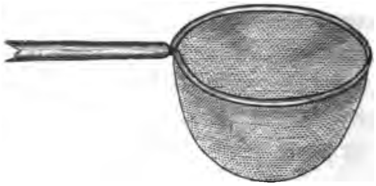


FIG. 3. Scoop Net.

Another method of using the net is called "beating." This method is used in collecting insects from bushes, and consists of lifting the net, mouth upward, and striking it sharply against the branches or leaves, thus jarring the insects into it.

To use the net in water, sweep the water plants as quickly as possible. In running streams, overturn stones, holding the net just below them, with the mouth up stream. An old dipper, made into a sieve by perforating the bottom with an awl, is a good utensil for collecting water insects.

Killing Bottle.—Any ordinary wide-mouthed bottle will answer for killing the captured insects. (Figs. 4 and 5.) An empty morphine bottle will do for ordinary insects; but for large butterflies and moths, a jar is required. These should preferably have a ground-glass stopper, as it is easier removed and replaced, but an ordinary fruit jar with a screw top will answer the purpose. In the bottom of this jar a few small pieces of cyanide of potassium should be placed; cover this with water, and pour in some dry plaster of Paris, until the water is absorbed. Leave the bottle open in a shady place for an hour and then wipe the dry plaster of Paris from its sides, put in the cork, and it is ready for use. The plaster of Paris forms a porous cement, which, while it holds the cyanide of potassium fast in the bottom, also allows the fumes of the poison to escape and fill the bottle. It should be labeled "poison." If kept corked when not in use, a killing bottle made like this will last a whole season. When they are captured, the insects are dropped into the poison bottle, the fumes of which overcome them in a few seconds. In the case of butterflies and moths the insects should, if possible, be transferred from the net to the bottle without handling, as even the most careful handling will damage these delicate insects. Some collectors carry a small bottle of chloroform (Fig. 6) and put a drop or two in the killing bottle. This causes instantaneous death, and the insects are not damaged by fluttering and beating their wings against the sides of the bottle. Do not breathe the fumes of the bottle, for they smell bad and are not good for you. When you open the bottle to put an insect in it, hold it away from your face and cork it up again as quickly as possible.

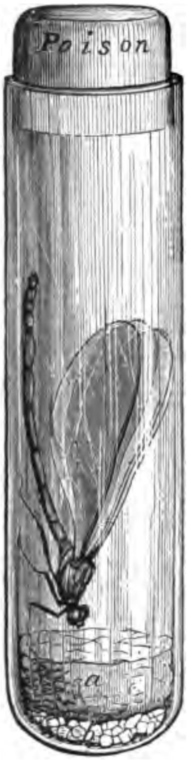


FIG. 4. Cyanide bottle.

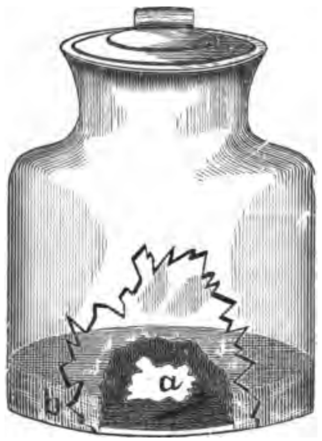


FIG. 5. Another form of cyanide bottle.

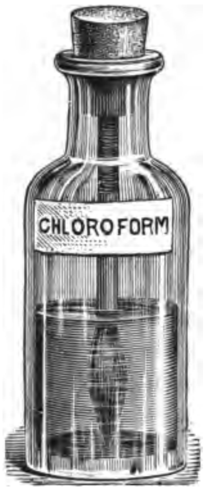


FIG. 6. Chloroform bottle and dipper.

Some insects may be caught from flowers, etc., directly into the bottle, by holding it uncorked beneath them for a moment; the fumes of the poison soon overcome them and they drop into the bottle.

In taking insects from the net, take the bottle in the right hand and the cork in the left; insert the bottle into the net, and place the mouth of it over an insect crawling on the inside of the net; then put the cork on the outside of the net into the mouth of the bottle, net and all, for a moment until the insect falls into the bottom of the bottle; then remove the cork and take the rest of the imprisoned insects in the same way. Insects should be left in the bottle at least an hour, and may be left in there over night without injury to the specimens.

For removing insects from the bottle, a pair of forceps (Fig. 7) will be found of much use, especially in handling smaller and more delicate species. A supply of alcohol and a few small bottles for preserving soft-bodied insects, caterpillars, etc., should form a part of every collector's outfit.

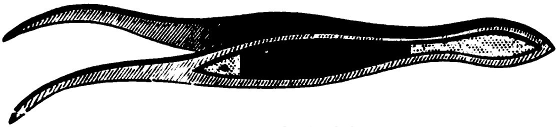


FIG. 7. Entomological forceps.

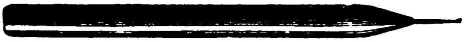


FIG. 8. Setting needle.

Preservation of Specimens.—If it is not desired to mount the specimens immediately after their capture, a large part of them, such as the beetles, and other insects which will not be damaged by it, may be preserved in alcohol. With butterflies and moths it is usual to inclose them, with their wings folded, in small envelopes, when they may be stored in a box until wanted. Small drug envelopes are suitable for this purpose, or the collector may make his own envelopes from flat paper folded as shown in the accompanying diagrams (Figs. 9 and 10). A little naphthalene should be placed in the boxes containing the dry specimens, in order to keep out mites and insects which are liable to injure the specimens. For this purpose, Bishop's moth-ridder, which comes in flakes, is as good as anything, and a small amount scattered among the papers will be effective.

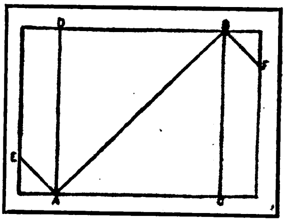


FIG. 9. Method of folding paper for envelope. First fold on the line A B, then on A D and C B, and then on B F and E A.

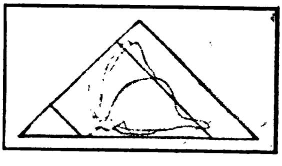
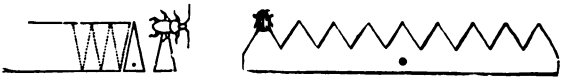


FIG. 10. Butterfly in envelope.

Mounting Specimens.—For mounting insects a good supply of naturalist's pins is required. These are longer and more slender than the ordinary pins, and have smaller heads. They are much better than the common pins, which, besides being too thick, soon corrode, cover the specimen with verdigris, and render it valueless. The best pins for the purpose are German insect pins numbered from 1 to 5. The No. 1 size is very delicate and is used only for the smaller insects; No. 5 is suitable for very large insects; No. 3 is the most serviceable size. These pins can be purchased from any dealer in naturalist's supplies at 15 cents per hundred.

In mounting beetles the pin is thrust through the right elytra or wing cover, leaving about one third of the length of the pin projecting above. In the true bugs the pin should be inserted through the scutellum, the triangular piece at the base of the wings. In other insects, such as moths, butterflies, bees, flies, etc., the pin is inserted directly through the center of the thorax. The cuts accompanying this paper will give a good idea of the method of pinning the different classes of insects. Small insects are best mounted on triangular pieces of cardboard, as it is difficult in many cases, and impossible in some, to thrust even the most delicate pins through them without destroying them. These points may be cut from light bristol board and should be about three eighths of an inch long, as shown in Figs. 11 and 12. A pin is inserted in the base of this, and the point is touched with mucilage, prepared glue, or other adhesive preparation. The insect is placed on its back and the prepared point is touched to its under side. By this method it can be picked up without difficulty.


FIGS. 11 and 12. Cardboard points for mounting small insects.

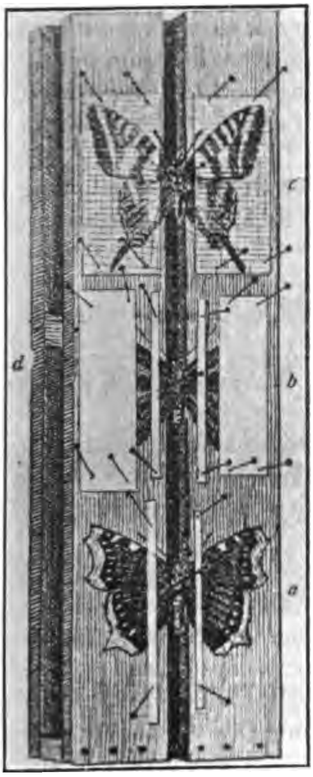


FIG. 13. Spreading-board for Lepidoptera.

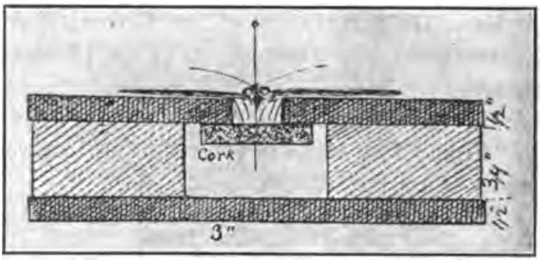


FIG. 14. Sectional view of spreading-board in front of cleat "d" in Fig. 13.

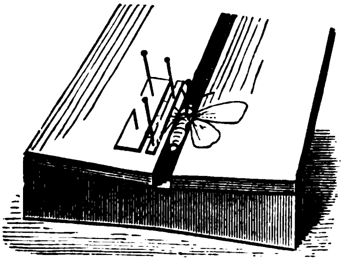


FIG. 15. Method of spreading butterfly on board.

For butterflies, moths, and other insects in which the wings are to be spread, a spreading-board is needed. A very good idea of this can be had from the illustrations (Figs. 13 and 14). It is easily made, consisting of two thin strips of half-inch pine board, 12 to 16 inches long and 1½ to 3 inches wide. These are fastened to cleats on the under side to hold them together, while a space varying in width to admit the bodies of different sized insects is left between them. On the under side of this space a sheet or strip of thin cork is fastened. The pin on which the insect is fastened is pushed through this cork, and the body inserted in the open space between the strips until the wings are on a level with the surface of the board. The wings are then brought forward until the posterior borders of the front ones are at right angles to the body, where they are held in place by strips of writing paper or thin cardboard, as shown in the illustration (Fig. 15). When the insect has been properly spread it should be put away on the mounting-board and left for a week or ten days to dry. After this time it may be carefully removed from the board and put in place in the collection.

Mrs. Anna B. Comstock, of Cornell University, gives the following instructions and illustrations (Figs. 13 and 14) for making spreading-boards:

"Materials needed for a medium-sized spreading-board:

"First—Two strips of pine or other soft wood 18 inches long, 1½ inches wide, and ½ inch thick.

"Second—One strip of wood 18 inches long, 3¼ inches wide, and ½ inch thick.

"Third—Two cleats 3¼ inches long, ¾ inch high, and ½ inch thick; and two cleats 1 inch long and as high and thick as the others.

"Fourth—A strip of cork or linoleum 17 inches long and a little less than an inch wide.

"To construct the spreading-board take the two narrow strips of wood, place them one fourth of an inch apart, and on the under side fasten them across the ends to the longer cleats. Then on the same side as the cleats tack a piece of cork or linoleum over the space between the strips of board, and as the cleats are over one half inch wide the linoleum should cover all the space left. Then midway on the boards fasten the two smaller cleats. Fig. 14 shows a cross-section of the spreading-board just in front of these two middle cleats. Now it is ready for the bottom board, which will fit exactly if directions are followed, and this completes it. The space between the two upper boards is wide enough to take in the body of the moth or butterfly. The cork or linoleum below the space will hold firmly the pin on which the butterfly is impaled. The cleats hold the top and bottom boards apart, and so protect the points of the pins. Spreading-boards may be made much smaller or much larger to suit."

In mounting dried specimens it will be necessary to relax them, and for this purpose they are placed in a covered box in which is a shallow layer of damp sand, over which a sheet of thin paper has been placed.

After remaining on this for from twelve to twenty-four hours, the insects will become pliable, and can be set on the board and put away to dry permanently. In handling insects, and especially in mounting the smaller and more delicate specimens, an almost indispensable instrument is the setting needle (Fig. 8). This may be an ordinary sewing-needle inserted in a wooden handle, or a more elaborate instrument prepared for the purpose and sold by the supply dealers. The one, however, is no better for the work than the other.

Insect Boxes.—After his insects are mounted, the next requirement of the collector is a receptacle of some kind in which to keep them. This may be anything from an ordinary cigar box to a highly-finished cabinet, costing hundreds of dollars. For beginners, cigar boxes answer the purpose very well. They should be lined with cork, pith, or linoleum. The pith of the flower stem of the century plant, cut in sheets about three eighths of an inch thick, answers the purpose admirably, and in most parts of our State is very easily procured. For permanent collections, or for exhibition purposes, a more elaborate case is required. A good size for these we have found to be 15 by 21 inches and 2¼ inches deep in the clear. This should have a glass cover made to fit tight, so that all dust and insect pests can be excluded. Mrs. Comstock recommends a box 18 by 16 inches for school collections, and gives the following details for construction:

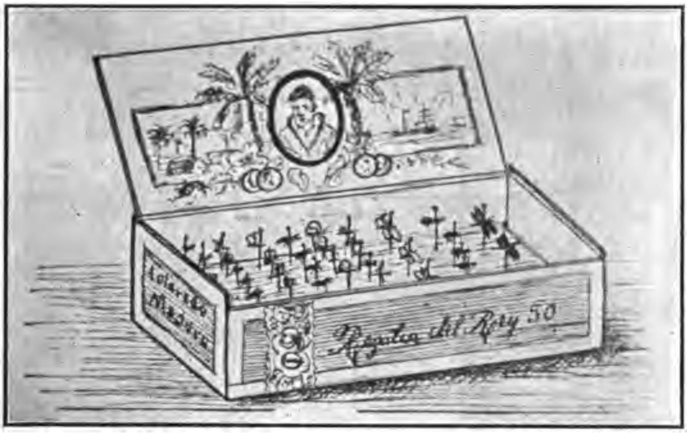


FIG. 16. A cigar-box insect case.

"For permanent collections the wooden boxes with glass tops are much safer; and as the insects may be seen through the glass these boxes are more practical for school collections. This kind of a box is shown in Fig. 17. Its sides are 18 by 16 inches and its height is 3 inches, outside measure. The upper edge of the sides of the bottom of the box is made with a tongue which fits in a groove made in the lower edge of the sides of the cover. This is done so that the top and bottom parts of the box shall very fit very closely together in order that the museum pests can not get in and destroy the specimens. The glass might be puttied in, like a window pane, if it is found difficult to make the groove. The corners of the box may be mitered and dovetailed, or mitered and nailed; the latter is more easily done. Any carpenter or cabinet-maker can make this box; but great care must be taken to use only thoroughly seasoned wood in its construction. Otherwise, the bottom will be sure to warp and shrink and leave cracks through which the museum pests will enter. Pine is not at all suitable, on account of the resin in it. Screw-eyes may be put into these boxes and they may be hung on the walls of a schoolroom, like pictures."

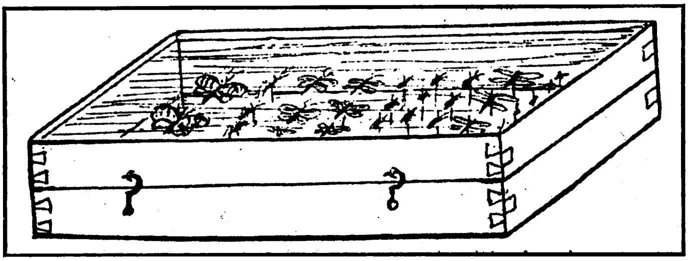


FIG. 17. A cheap exhibition case, with glass top.

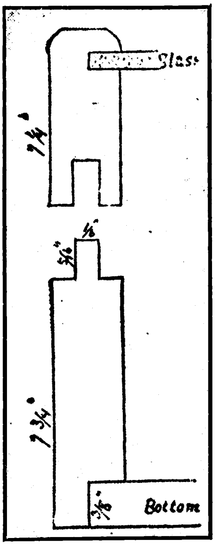


FIG. 18. Cross-section of side of insect box (Fig. 17), showing method of construction and giving measurements.

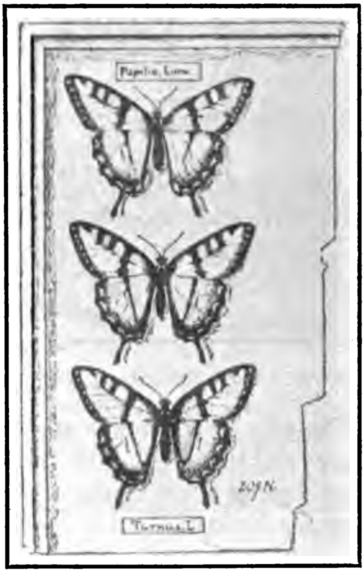
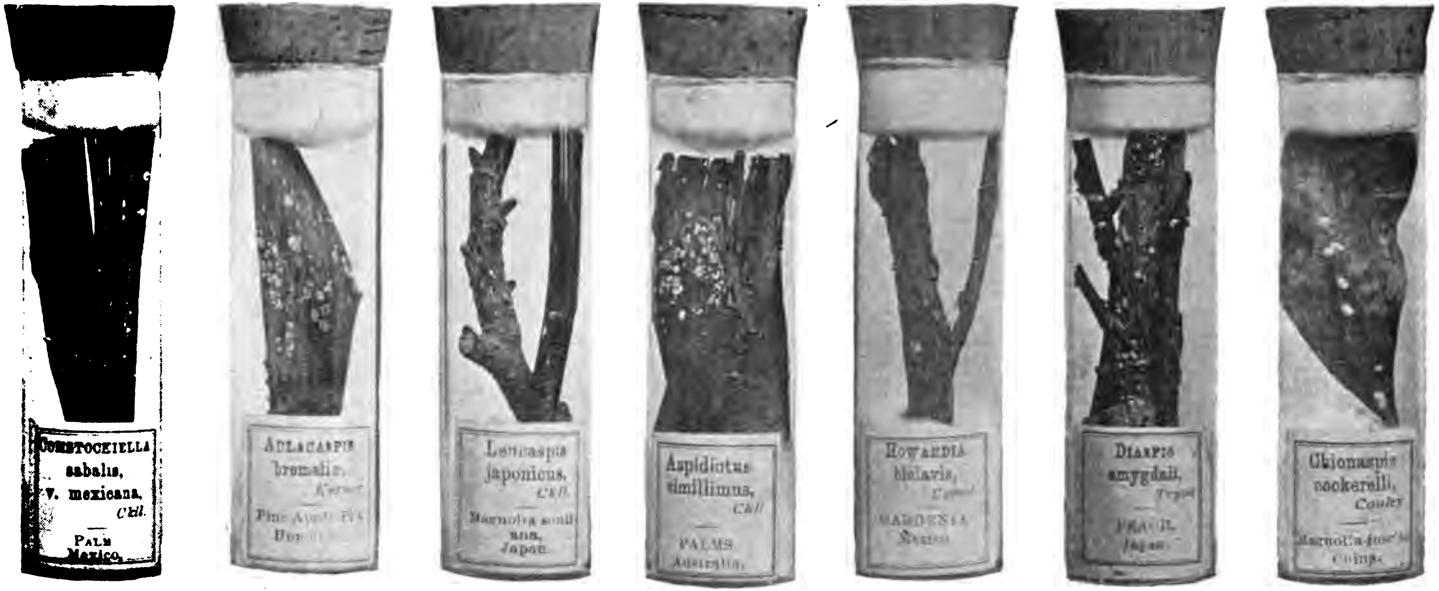

Papilio, Linn.
Turnus, L.

FIG. 19. Method of mounting Lepidoptera in cabinet cases.


COMSTOCKIELLA sabalis, v. mexicana, Ckll. PALM Mexico.
AULACASPIS bromeliæ, Kerner. Pine Apple
Leucaspis japonicus, Ckll. Magnolia soulieana, Japan.
Aspidiotus simillimus, Ckll PALMS Australia.
HOWARDIA biclavis, GARDENIA
DIASPIS amygdali, Tryon PEACH. Japan.
Chionaspis cockerelli, Cooley Magnolia fuscata China.

ALEXANDER CRAW'S METHOD OF PRESERVING SPECIMENS OF SCALE INSECTS FOR THE CABINET.

For the preservation of scale insects, Mr. Craw has devised a very excellent plan of putting them up in small vials, which he describes as follows (see illustrations on page 167):

"The method is to take a little naphthaline flakes or camphor in the bottom of the vial, covered with a little cotton; this prevents injury to the specimens by cabinet mites. The cork or stopper is pressed in, together with a little absorbent cotton, and the latter trimmed off even with the edge of the vial, making a neat finish. Before placing the infested twigs in the vial, they are subjected to the fumes of C. P. cyanide of potassium for a few hours, or are fumigated with hydrocyanic acid gas, and then placed between blotting paper, without pressure, until all moisture has evaporated. The specimen is then placed in the vial as near as possible to the glass, so that it can be readily examined with a lens without having to remove it. The specimen is cut long enough so that the cotton on the cork touches it, and this holds it in position, preventing it from shaking about in the vial and injuring it. The name of the scale, together with the name of the food plant and habitat of the insect, are printed upon neat labels and gummed to the base of the vial. This record is of importance, as it may be the means of determining where to search for the natural enemies of a species of scale insect."

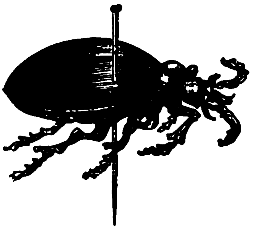


FIG. 20.

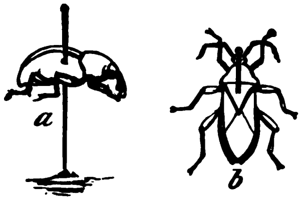


FIG. 21.

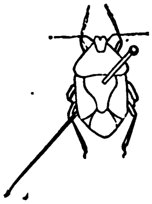


FIG. 22.

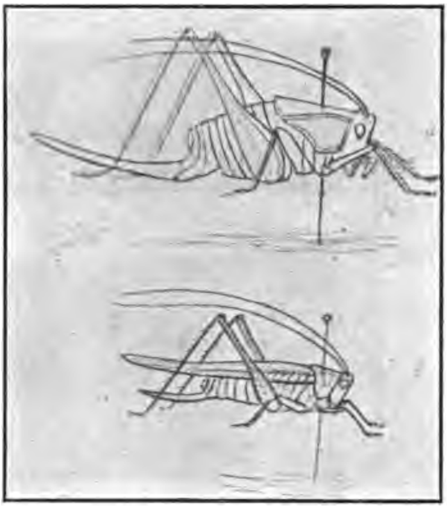


FIG. 23.

METHODS OF PINNING DIFFERENT CLASSES OF INSECTS.

Museum Pests.—In order to preserve collections, great care must be taken to exclude all pests which prey upon them. Among the worst of

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NOTE.—Illustrations Nos. 13, 14, 16, 17, 18, and 23 to 28 are from Mrs. A. B. Comstock.

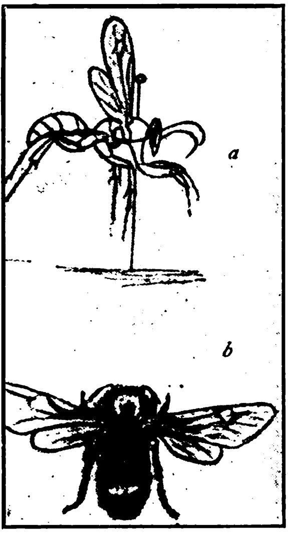


FIG. 24.

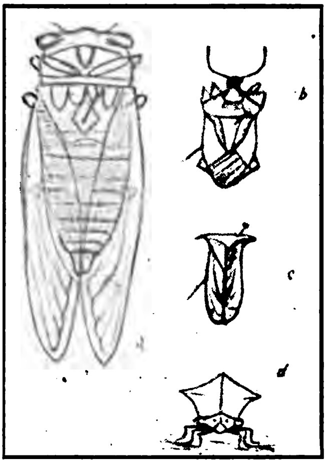


FIG. 25.

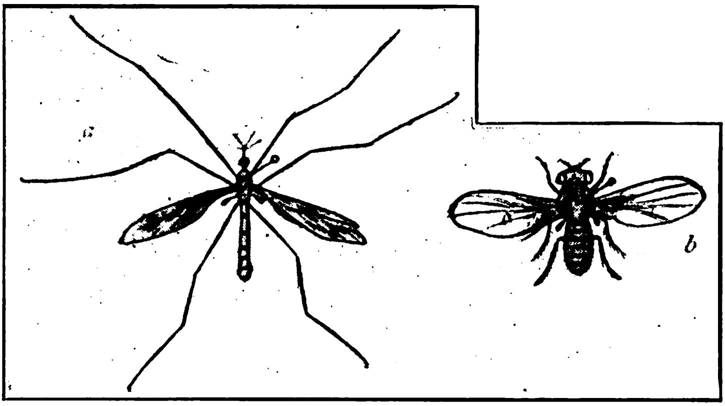


FIG. 26.

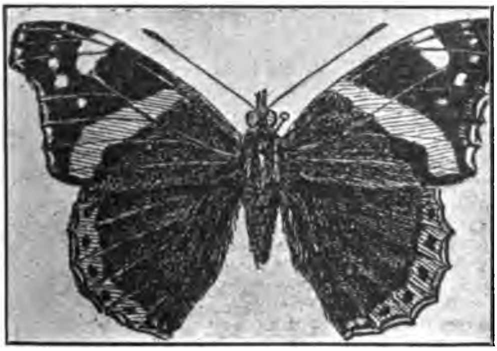


FIG. 27.

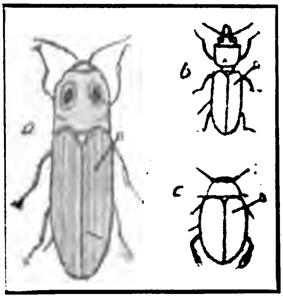
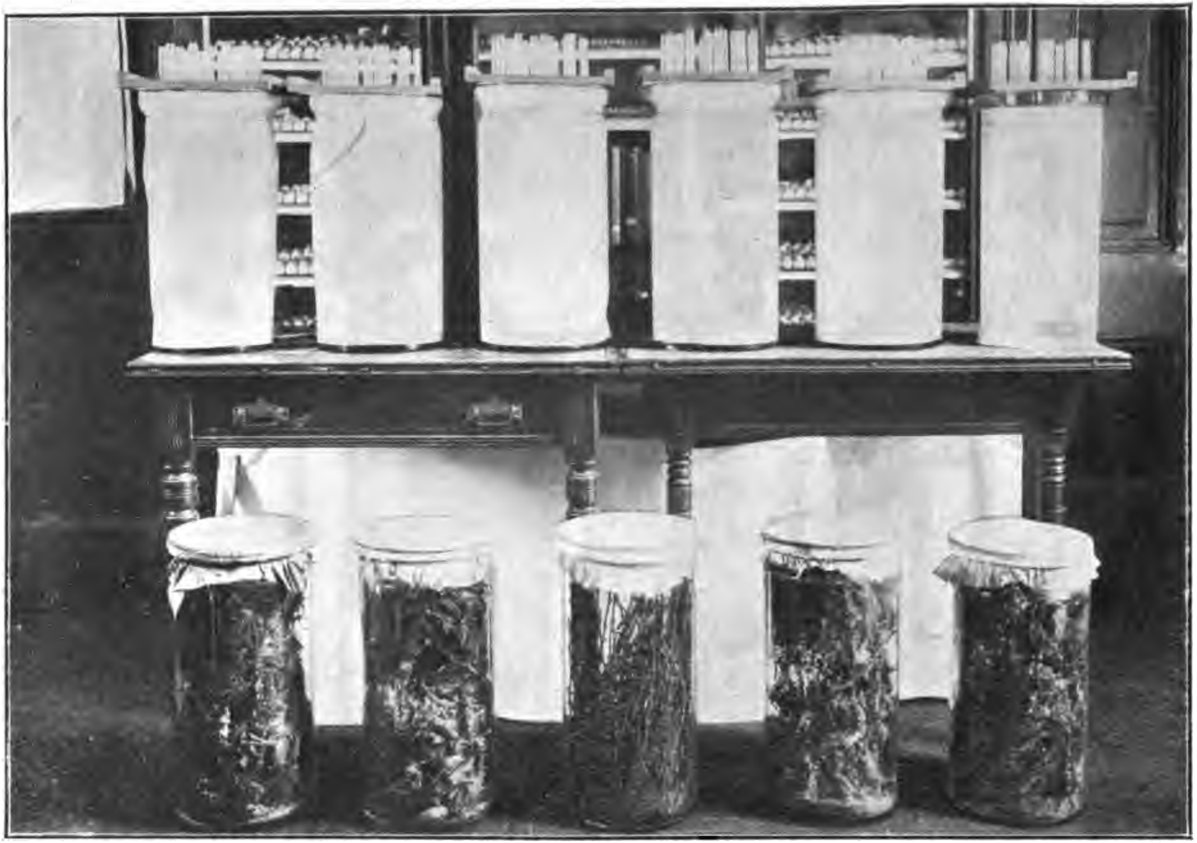


FIG. 28.

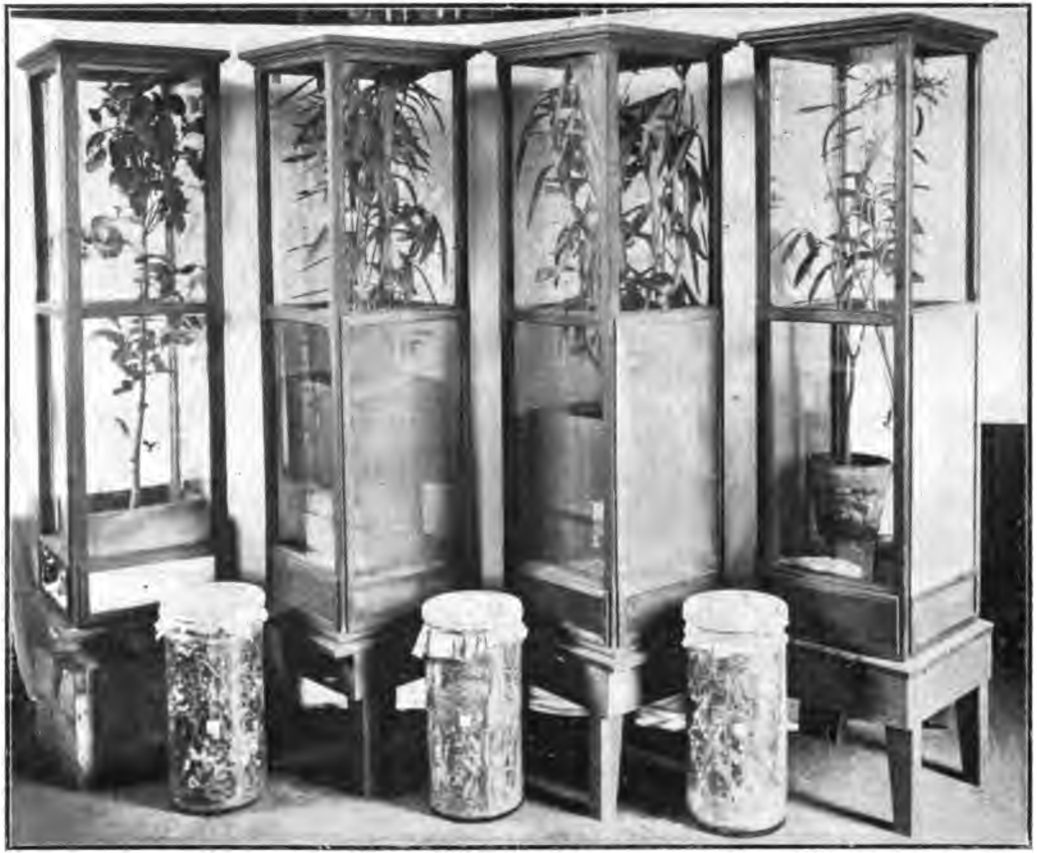
METHODS OF PINNING DIFFERENT CLASSES OF INSECTS.

these are some small beetles belonging to the genus Dermestes and Anthrenus, which find entrance through the smallest opening and lay their eggs upon the dried specimens. The larvæ work unseen within the bodies of the pinned insects, and in time cause their total destruction. To prevent this a piece of naphthaline, an ordinary moth ball will do, should be kept pinned to one corner of the specimen case; and if at any time a small quantity of fine dust is observed under the pinned specimen it is evidence that the pest is at work. A spoonful of bisulphide of carbon may be poured into the box, which should be closed quickly and left. Benzine will answer the same purpose, but as this is highly inflammable, it should never be used in the presence of a lighted lamp or near fire of any kind.



INSECT BREEDING-JARS, SHOWING METHOD OF BREEDING AND CAPTURING BENEFICIAL INSECTS FOR SHIPMENT.

The insects are bred in the jars, as shown in the lower part of the illustration. In order to capture them, the jars are darkened, as shown in the jars on the table. A board cover is placed over each jar and this is filled with half-inch holes. Into each of these holes a small vial is tightly fitted. The insects work up to the light, and when a colony has entered a vial, it is replaced by another, and the captured colony packed for shipment.



BREEDING-CASES FOR BENEFICIAL INSECTS, IN SAN FRANCISCO OFFICE.

MISCELLANEOUS PAPERS.

WOODPECKERS.

The birds belonging to the woodpecker family are the best friends the farmer has among the feathered tribe, performing services that no other bird is capable of doing, because of the peculiar structure of their bills and particularly of the tongue. The little damage caused by woodpeckers in an orchard is compensated more than a hundredfold by the good they do. In orchards frequented by woodpeckers the damage done by the larvæ of wood-boring and bark-boring coleopterous insects is reduced to a minimum, and these birds should never be permitted to be wantonly killed.

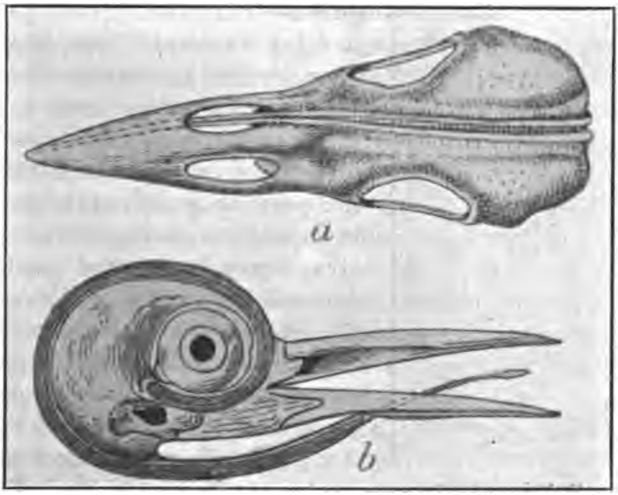


FIG. 1. Special development of tongue of Woodpeckers: (*a*) Skull of Flicker (*Colaptes auratus*), showing root of tongue extending to tip of bill (after Lindahl); (*b*) Head of Hairy Woodpecker (*Dryobates villosus*), showing root of tongue curving around the eye (after Audubon).

There are many varieties of woodpeckers in California, but the most numerous and conspicuous is the red-headed, of which there are several varieties. However, their habits are almost identical and all are beneficial.

The tongue is the most peculiar part of the anatomy of these birds, as a reference to the cut will show. The following description is taken from the Year Book of the U. S. Department of Agriculture for 1900: "The tongue is extended backward by two slender filaments of the hyoid bone, each incased in a muscular sheath. These filaments, instead of ending at the back of the tongue, curve up over the back of the skull, across the top of the head, and down on the forehead, and in some species enter the opening of the right nostril and extend forward to the end of the beak, as in the flickers. In other species it enters the head and curves around the eye. The tongue is practically twice the length of the head. By means of the surrounding muscular sheath, the tongue can be protruded from the bird's mouth a considerable portion of its length, and can thus be inserted into the burrows of wood-boring larvæ. In order to secure grubs or other insects it is usually furnished with a sharp point and is barbed on the sides." [The common woodpecker of this State has the horny plate on the end of the tongue rather blunt, and on the sides are hair-like appendages which lie pointing backward from the tip, but when inserted in a larva and withdrawn, the hair-like forms stand out at right angles to the tongue, thus insuring a firm hold on the grub.] "It is evident that a bird possessing such an apparatus must be capable of doing work which less advantageously endowed species can not accomplish. Hence, while most birds content themselves with eating such insects as they find on the surface, woodpeckers seek those larvæ or grubs which are beneath the bark or even in the heart of the tree. To render more effective the mechanism here described, these birds are gifted with a remarkably acute sense of hearing by which to locate their prey within the wood. That they do so with great accuracy is disclosed by examination of their work, which shows that they cut small holes directly to the burrows of the grubs."

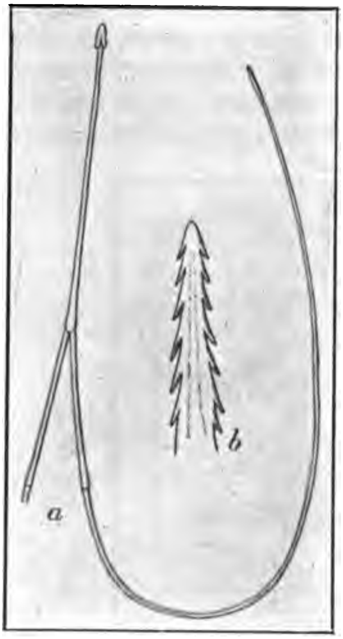


FIG. 2. Tongue of Woodpeckers: (a) Hyoid bone of Flicker (*Colaptes auratus*); (b) Tip of tongue of Downy Woodpecker (*Dryobates pubescens*). [U. S. Year Book.]

Woodpeckers are active and noisy birds. When searching for food they usually alight near the base of the tree and then, ascending, search every nook and crevice for a pupa, hibernating insect, or eggs, which they greedily devour. In orchards infested with the codling-moth they destroy many of them. They are also great destroyers of ants, which, it is stated, constitute twenty-three per cent of their food.

The flicker, however, does the best service in the destruction of ants, and it is mentioned that two stomachs which were examined contained more than 3,000 ants. Besides catching them on the trees, it also obtains many on the ground, which it visits mainly for this purpose. It will excavate to a considerable depth a nest of ants by means of its bill, removing great mouthfuls of dirt at a time, and devouring ants, grubs, and eggs. It will puncture a row of holes on the trees from which the sap exudes, which attracts ants, afterward revisiting the trees on which the holes are located to capture the ants. Flickers are sometimes guilty of boring holes in the sides of houses for nesting or storage purposes, but generally they are not harmful.

Woodpeckers are very provident birds, storing acorns, etc., for future use. They bore holes in trees, generally in dead wood, in which they store great numbers of acorns, with the end to which the cup was attached pointing outward. The acorns can readily be removed from the dead wood, but not from the green wood after they have been in the holes for a few days, which has led many people to believe that the woodpeckers bore the holes only sufficiently large to receive the acorn, which is then forced into the hole so tightly as to prevent its removal without destroying it. But such is not the case. In the fall of the year, when woodpeckers are engaged in storing acorns, the sap which has been elaborated in the leaves is descending and rapidly forming wood; so that, while the hole which the woodpecker made in the wood for the reception of the acorn was sufficiently large to enable the woodpecker to insert it easily, in a few days the wood grows tightly around the acorn, preventing its extraction.

Almond orchards suffer somewhat from the depredations of woodpeckers, not so much from what they eat while in the orchard as from the quantity they carry away to store. Near Farmersville, in Tulare County, was a large oak tree with an opening in it some distance from the ground. The tree was hollow, with another opening close to the ground. Near by were almond trees, the nuts of which the woodpeckers would gather, and, after hulling, would drop them into the topmost hole, and from the lower hole the thrifty farmer removed more than a bushel in one season.

There is one species of woodpecker which, without doubt, is injurious to the horticulturist. It is the yellow-bellied woodpecker, commonly called the "sapsucker." This bird injures trees, generally in the spring when the sap is flowing, by pecking numerous holes very close together, oftentimes completely girdling the tree, and sometimes destroying it. The bird does this for the purpose of eating the soft tissues of the inner bark and sapwood. It also drinks the sap which accumulates in the pit and devours the insects that are attracted by the sweetness of the sap. From this fact the sapsucker may be easily destroyed in the following manner, according to President Ellwood Cooper of this Board: Mix honey and strychnine together and smear the tree that has been punctured by the sapsucker, immediately above the row of holes, so that the poisoned honey will flow downward and mingle with the sap. The sapsucker on his return will imbibe the sap and with it the poison.

Sapsuckers are difficult to shoot in an orchard, because they will move around to the opposite side of a tree from a person and when taking wing will have the brush of the tree between him and his enemy. An old United States Year Book gives the following as the means of killing woodpeckers, which we quote without recommendation:

"As a means of protecting fruits a bare pole is placed beside a tree and reaching a little higher than its summit. Upon this the bird alights by preference, when a blow given to the pole below will produce such a vibration as will cause the bird to fall dead."

Sapsuckers are generally residents of the lower foothills, but in spring they migrate to the valleys, and it is at this time of year that they are most injurious to fruit trees.

WINTER IRRIGATION OF DECIDUOUS ORCHARDS.

In many sections of California where it is necessary to irrigate deciduous orchards the supply of water in the summer time, when irrigation is most practiced, is short and inadequate to the demand, yet there is an abundance of water in the winter time, but which is allowed to run to waste. That it is possible to utilize this wasted winter supply and store it for use in the growing season during summer has been demonstrated by experiments made by A. J. McClatchie, of the Arizona Experiment Station.

The climate and soils of Arizona are similar to our own in many sections where irrigation is practiced. What has been successful there should likewise prove so here under similar conditions.

Growing plants have need of more water than is generally supposed. Professor King, of the University of Wisconsin, made experiments to determine the amount of water necessary to produce a ton of dry matter of barley, corn, peas, potatoes, etc., and found that it would require an average of 450 tons of water to produce a ton of dry matter. An inch of water equally distributed over an acre will weigh about 113 tons.

Professor McClatchie, in his experiments in the winter irrigation of deciduous orchards, applied about 3 feet of water, beginning December 16th and continued to March 5th. No irrigation was applied for eight months, during which time the rainfall was but 2½ inches, and the results were most satisfactory. Though the summer during which the experiment was tried was unusually dry, the trees maintained vigorous growth, and at the end of the driest, hottest spell during May and June of which there was any record in that Territory, the orchard showed no signs of drought whatever, peach trees making a growth of about 4 feet, and apricot trees of 3 to 6 feet. The apricot trees during the hot period matured an excellent crop of fruit, and the peach trees in July and August matured an unusually heavy crop of fruit. Though having received no irrigation for eight months, no thriftier or more vigorous orchard existed, although many orchards died in the valley in that vicinity.

Professor McClatchie gives the following as the advantages of winter irrigation and the reasons for the effects:

"During the winter the lower temperature and the higher relative humidity cause evaporation to be much slower than during the remainder of the year. In applying water, therefore, comparatively little escapes into the atmosphere. The supply of water being greatest at that time of the year, makes it possible to apply large amounts at short intervals, thus avoiding the loss that occurs if small amounts are applied at greater intervals. Then, too, the trees are dormant and roots need little air, hence no injury is done them by keeping the soil super-moistened or by letting the surface bake to some extent. Consequently cultivation after each irrigation is not necessary, much time being thus saved.

"Trees make use of and consequently need water much earlier than is commonly supposed. An examination made February 20, 1900, revealed that at the depth of 10 to 16 feet even young roots 3 to 6 inches long had already grown. At this date there were few above-ground indications of growth, and it would not have been supposed by making a casual observation that the trees would make use of any water that might be applied. While the air above ground is still too cool to start development of the buds, the roots far beneath the surface are making a growth that prepares the tree for the demand for water that the leaves will make later. Thus, if the trees have an abundance of water during the winter, the early root growth that will be made will enable them to make a rapid growth as soon as the air above ground is warm enough to permit it. These facts account for the rapid and vigorous growth that the winter-irrigated orchard made in early spring compared with those that had not been irrigated."

The soil on which this orchard grew was composed of the first 6 feet of loam, then about 7 feet of fine gravel, about 1 foot of clay, 2 feet of gravel, about 16 feet of clay, and last about 2 feet of clay and gravel, when the ground water was reached at the depth of 34 feet. Roots in abundance were found penetrating the clay and gravel at a depth of 12 and 16 feet, and many were traced beyond 20 feet.

An examination of the moisture content of the soil showed "that the total loss of water from the upper 25 feet during the spring, summer, and autumn was about 20 inches. Deciduous orchards use and need the major part of the water-supply during spring and early summer, which need can be best supplied in most of southern Arizona by filling the subsoil with water during winter."

The conclusions of Professor McClatchie are as follows: "The amount of water needed by a deciduous orchard to keep it in good condition in southern Arizona from March to November is about 21 inches, which can be stored in the soil by the application of about 3 feet during winter. The amount that need be applied to grow a green-manuring crop and store enough water in the soil to carry a deciduous orchard through the summer is about 4 feet. Deep winter irrigation followed by thorough summer cultivation is better for deciduous orchards in southern Arizona than the frequent application of small amounts of water during the growing season. If about the middle of the summer water is available in abundance, it would probably be wise to give the orchard a thorough irrigation in as short time as possible, and then follow the irrigation with a thorough plowing, as in the spring after the winter irrigation ceases. But frequent summer irrigations are decidedly not advisable under our conditions, where the soil is fairly deep and retentive of moisture."

Another advantage to be gained by keeping the subsoil well moistened is that the roots will form at a greater depth and not near the surface as when summer irrigated, and will not dry out or be subject to fluctuations of growth between irrigations in summer.

When the deficiency of rainfall is apparent by the first of March in this State, it would be wise for horticulturists who have an abundance of water at that time of year to irrigate their orchards sufficiently to at least bring the amount of water up to what would be precipitated in an average heavy seasonal rainfall, which could do no harm. Experiments in the future, we have no doubt, will prove that it is better and more economical to store water in irrigated lands in the subsoil of farms than in more expensive reservoirs.

But there are sections in California where it might not be wise to winter irrigate and fill the subsoil with water. In alkali districts this might cause the rise of salts to the surface, which would prove injurious to the orchards. But in non-alkaline districts we have no doubt it would prove as beneficial as the experiments in Arizona have shown, whose soil, climate, and rainfall are not dissimilar to our own.

INFLUENCE OF WIDE TIRES AND HEIGHT OF WHEELS ON DRAFT OF WAGONS.

The Agricultural Experiment Station of Missouri has been making tests of the influence of the width of tires and the height of wheels on the draft of farm wagons, from which we copy a summary of the results and conclusions drawn.

It is estimated that the public roads of the United States aggregate 1,500,000 miles in length and that the total wagon transportation is approximately 500,000,000 tons. The average distance of haul is placed at eight miles, and the average cost of transportation for one ton for this distance is assumed to be $2, making the total yearly cost for wagon freighting $1,000,000,000. It is claimed that this freight could be transported the distance of eight miles over first-class roads at an average cost of 80 cents per ton. On this basis, a saving of $600,000,000 a year in the cost of wagon transportation could be effected by having first-class roads in all sections of the country. The magnitude of this saving will be better appreciated when it is realized that it amounts to one fourth of the value on the farm of all the farm products of the United States.

Numerous tests of the draft of wide and narrow tired wagons were made on macadam, gravel, and dirt roads in all conditions, and on meadows, pastures, and plowed fields, both wet and dry. The net load was in every case 2,000 pounds, and, contrary to public expectation, in a large majority of cases the draft was materially less when tires 6 inches in width were used than when the tests were made with tires of standard width—1½ inches.

On a macadam street a load of 2,518 pounds could be hauled on the broad tires with the same draft that a load of 2,000 pounds could be hauled on narrow tires.

In all conditions of the gravel road, except wet and sloppy on top, a load of 2,482 pounds could be hauled on the broad tires with the same draft required for a load of 2,000 pounds on the narrow tires.

On dirt roads, when dry and hard, and free from ruts and dust, 2,530 pounds could be hauled on the broad tires with the same draft required for 2,000 pounds on the narrow tires. With the dust two or three inches deep, the results were unfavorable to the broad tire, and it was the same when the roads were muddy and sticky on the surface and firm underneath. With the mud deep and drying on top, or dry on top and spongy underneath, it was unfavorable to the broad tires. As the road dries and becomes firmer, the difference between the draft of the broad and narrow tires gradually diminishes, until it reaches about 25 to 30 per cent on dry, hard, smooth dirt, gravel, or macadam in favor of the broad tire. When mud becomes soft and deep, the difference between the draft of the two types of wagon rapidly diminishes, and finally the narrow tires pull materially lighter.

A large number of tests on meadow pastures, stubble land, corn ground, and plowed ground in every condition, from dry to very wet, show a large difference in favor of the broad tires, ranging from 17 to 120 per cent. When it is considered that most of the freighting done by the farmers is on the farm itself, this saving of draft should have a serious consideration.

Numerous tests of the drafts of wagons with wheels of different heights were made. Standard, front wheels 44 inches, rear wheels 55 inches; Medium, front wheels 36 inches, rear wheels 40 inches; Low, front wheels 24 inches, rear wheels 28 inches. The following is a summary of the results:

For the same load, wagons with wheels of standard height draw lighter than those with lower wheels, and the difference was greater on road surfaces in bad condition than on good road surfaces.

Low wheels cut deeper ruts than those of standard height, and the vibration of the tongue was greater in wagons with low wheels.

For most purposes wagons with low wheels are more convenient than those of standard height.

Wagons with broad tires and standard wheels require much room in turning.

Diminishing the height of wheel to 30 from 36 inches in front and 44 to 40 inches in rear did not increase the draft in as great proportion as it increased the convenience of loading and unloading ordinary farm freight; but diminishing the wheels below 30 inches in front and 40 inches in rear increased the draft in greater proportion than it gained in convenience.

On good roads, increasing the length of rear axle so that front and rear wheels will run in different tracks to avoid cutting ruts did not increase the draft; but on sod, cultivated ground, and bad roads, it did.

The chief drawback to the use of broad-tired wheels has been their unwieldiness. The rim of the wheel coming so much nearer the bed of the wagon cramps it sooner in turning, and so requires more room. But if we diminish the diameter of the wheel to facilitate turning we increase the draft.

Numerous experiments proved that the difference in draft between high and medium wheels is not great, while between medium and low it is considerable.

The greater ease with which wagons with wheels of medium height can be turned and loaded and unloaded would more than counteract their increased draft over those with wheels of normal height.

Considering draft, convenience, etc., it is believed that the most suitable height for wheels of a farm wagon, especially with wide tires, is 32 to 36 inches in front and 36 to 42 inches in the rear.

REPORTS

OF

ALEXANDER CRAW,

HORTICULTURAL QUARANTINE OFFICER.

HORTICULTURAL QUARANTINE REPORTS.

By ALEXANDER CRAW,
State Horticultural Quarantine Officer.

To the Honorable the State Board of Horticulture:

GENTLEMEN: I herewith present to you my semi-annual report, including the summer months that are usually light in importations of nursery stock.

There have been received and inspected, however, 87 crates, cases, and bundles of trees and plants, besides 148 loose lots (numbering from one to eleven plants in each lot), 7,774 cases of citrus fruits (mostly limes), 1,593 crates of pineapples, and 1,668 packages of miscellaneous fruits.

The above list was found upon 132 steamships and sailing vessels, since my last report. I am present during the landing of passengers and the examination of their baggage. As heretofore, all trees, plants, and fruits infested with injurious insects or diseases new to the State have been destroyed.

Another mongoose was taken and killed on the 6th of June, and presented to the Academy of Sciences for its collection. On June 7th, a Los Angeles paper referred to the existence of a living mongoose in that city, in a Broadway store. I immediately wrote to Horticultural Commissioner J. W. Jeffrey, of Los Angeles, requesting him to take action under Section 6 of the Act of March 11, 1899, and see that the animal was destroyed. Mr. Jeffrey learned that it was brought into the State by rail from a Texas port and that it died soon after its arrival. Shortly afterward I received a letter from T. S. Palmer, Assistant Chief of the United States Biological Survey, Washington, D. C., inquiring as to what action had been taken in regard to this mongoose. I sent him the correspondence relating thereto.

On May 31st, we destroyed an importation of several thousand Japanese "song cricket" eggs. The importers claimed that they had a certificate from Dr. Stuart Eldridge, Assistant Surgeon, U. S. Marine Hospital Service, Yokohama, Japan, certifying that the insects were not injurious to plantations or fields, but the certificate was not produced. I wrote to Dr. Eldridge, and he sent me a copy of a letter he had forwarded at the time to the Collector of Customs at this port, showing that he had done all in his power to prevent harm from the importation in question. The following is a copy of Dr. Eldridge's letter:

> By steamship "Nippon Maru," leaving to-morrow, goes one parcel of the eggs of an insect upon the invoice of which I have placed the following indorsement:
>
> "The foregoing eggs are those of a species of cricket, called by the Japanese 'Kutsuwa-mushi,' which is kept by the natives in cages on account of its so-called musical cry. It is, of course, a vegetable feeder. In Japan it has never within my knowledge proved injurious; but, in view of the sad and unexpected results which, in some cases, have followed the introduction of exotic animals into fresh territory, I think it well to call attention to this shipment."

At various times heretofore we have destroyed living specimens of these crickets that came in fancy split bamboo cages from Japan. We have all the species of vegetable-eating crickets, katydids, and grasshoppers in the State that we care for. The song of the "Kutsuwa-mushi" would hardly compensate for the damage it would probably do.

Occasionally we find a few oranges in the possession of passengers from Mexico, which we confiscate and destroy. But no shipments of such fruits have been received from the maggot-infested districts since the destruction of the consignment received from Acapulco, Mexico, November 19, 1899, until Sunday, November 3d, of this year, when the steamship "Newport" arrived, and in her cargo were fifteen cases of oranges in which the maggots were present. I condemned the fruit and boxes and burned them.

I hope that Congress will take some action at the coming session, and pass a law that will prohibit the introduction of oranges from the infested sections. If a measure of this kind is not enacted, the growers of citrus fruits in the United States may soon have to wage war upon a pest that will be more difficult to control than the codling-moth in apples and pears.

I do not anticipate any satisfactory results from the Mexican Government's request to the Governors of the various States to have the pest stamped out of their districts. It is too serious a question for our Government to hesitate upon. From a personal interview with Secretary of Agriculture Wilson, I am satisfied that we can rely upon his hearty coöperation in preventing such a pest entering the United States.

Another perplexing question is the presence of the melon-cucumber maggot in Honolulu. Honolulu is now a domestic port, and the examination of baggage by customs inspectors has been discontinued, so that the pest may be brought in by thoughtless individuals bringing infested melons or cucumbers in their baggage. This pest is probably a native of Japan, as I have intercepted its coming from that country. It is not known to occur in the United States. As heretofore no products that would harbor this pest have been permitted to land. I hope your Honorable Board will advise me further as to what should be done to ward off that disgusting pest.

Last June a serious red currant pest, *Epochra canadensis*, was forwarded to me from Sebastopol, Sonoma County. This is the larva of a small fly. It enters the currant, causing it to shrink and decay. I advised the destruction, by burning, of all the currants, also the removal of the surface soil and its burial deep between the rows. This would get rid of any that had entered the soil to pupate. It can not be ascertained how this pest was introduced. Sonoma County, unfortunately, dispensed with its County Horticultural Commission a few years ago.

During the past summer, the Horticultural Commissioners of Tulare County stopped some ornamental plants at Lindsay which were from the East and which were infested with scale; samples were sent to me for determination. I found them to be the "Florida red scale" (*Aspidiotus ficus*), a pest of orange trees. This was a fortunate seizure, as Lindsay and Porterville are noted as early citrus districts.

The Commissioners of Los Angeles County recently found some ornamental plants from the East infested with the "Florida chaff scale" (*Parlatoria pergandei*), another citrus pest. The Commissioners of Riverside, San Bernardino, and several other counties, have lately found important pests on ornamental stock from Eastern States.

The Supervisors of several citrus-growing counties have strengthened the hands of their Horticultural Commissioners by passing ordinances against the introduction of citrus trees from States where the "white fly" (*Aleyrodes citri*) exists. This is a wise movement in the interests of their citizens.

On October 18th, the steamship "Australia" arrived from Tahiti, and a passenger had a package of vanilla stems, on which I found a single "red scale" (*Aspidiotus aurantii*). This shows the existence of that scale in Tahiti. Another scale from the same place was found infesting a package of Tradescantia plants, which I destroyed. This was *Icerya seychellarum*, a near relative of the "cottony cushion scale." It is smaller than the latter, and the back of the female is covered, or rather circled, with a double row of tufts of canary-colored cotton. Down the center of the back is a row of similar tufts. The egg sac is pure white.

From Australia came two orange trees infested with *Chionaspis citri*, the "orange snow scale"; also a holly bush with *Ceroplastis rusci*. All were destroyed.

From Mexico came plants infested with the following scale insects: *Parlatoria*, *Aulacaspis*, *Ceroplastis*, and *Asterolecanium*.

From Guatemala came palms infested with "red scale" (*Aspidiotus aurantii*).

From Japan, biotas with Tortrix larvæ feeding upon the foliage, and pine trees with "basket worms" (*Thyridopteryx*). The white circular scale (*Diaspis amygdali*) I again found upon tea plants from Japan.

This scale is a serious one wherever found upon peach, cherry, prune, and, in fact, upon nearly all deciduous fruit trees and a number of ornamental plants.

According to your instructions I visited Tehama County on June 3d and 4th and investigated the reported existence of the "olive-knot" (*Bacillus oleæ*) in several young orchards. With Mr. Harvey C. Stiles I visited a number of young olive orchards, and although we found indications of the disease there was no appearance of any virulent cases. This may have been owing to the fact that the trees had been planted within the year. It was the desire of a number of the orchardists to have the disease stamped out of the colony if possible, and as they anticipated some opposition on the part of non-resident owners, I submitted the matter to the Attorney General, to ascertain if the County Horticultural Commissioners or the State Board of Horticulture could take any action toward stamping the disease out of that and other counties where it had appeared. The opinion of the Attorney-General is given on pages 53 to 57, inclusive, of your bulletin, "Horticultural Statutes of California." It would appear that the County Horticultural Commissioners have power to abate such nuisances in their respective counties. There is nothing, however, in our statutes conferring such power upon the State Board of Horticulture. It is to be hoped that the County Horticultural Commissioners will see that the destructive olive disease is stamped out of the State.

On June 21st I was requested by District Attorney Gill, of Tehama County, to visit Red Bluff and testify regarding a shipment of fruit trees received from Oregon that were condemned and destroyed by Horticultural Inspectors R. W. Coats and A. W. Samson. The trial of the case had been proceeding for four days. Samples of the trees had been submitted to me by the Inspectors, and I had specimens of the root preserved in formalin, which I took with me, and they were introduced as exhibits in the case. Owing to the fact that the County Horticultural Commissioners had omitted to make application to your Board for Quarantine Guardian certificates for their Inspectors, the court decided that the Inspectors were not qualified to act as Quarantine Guardians, and decided the case against them. The trees, however, were adjudged to be of no commercial value, and the plaintiff was awarded damages, fixed at the nominal sum of one dollar.

It gives me pleasure to report to you the receipt of two packages of *Scutellista cyanea*, the South African internal parasite of the black scale; seventeen were alive upon arrival and were immediately placed in a breeding-case containing an oleander infested with black scale. One has since died, but the others appear to be active. The parasites were sent by Prof. Charles P. Lounsbury, Government Entomologist of Cape

Colony. The Cape Government is very anxious for California to have this valuable insect established here.

I am in receipt of a telegram from Dr. L. O. Howard, U. S. Entomologist, Washington, D. C., which reads: "Have at last got living *Erastria scitula* from Italy. Black scale enemy. Can you handle them to best advantage?" I wired him regarding the condition of our scale. Besides your own efforts to secure the natural enemies of this scale, it is encouraging to record the work of such men in behalf of our orchardists.

Dr. Howard has been conducting experiments with parasitical fungus from South Africa, for the destruction of grasshoppers. At my request, he has kindly forwarded tubes containing the fungus cultures to citizens of this State, with full instructions for establishing the disease. It is stated that the fungus will not affect human beings, domestic animals, or fowls.

On November 18th, Dr. Howard forwarded a colony of *Coccinella septempunctata* lady-birds that he had received from Europe; these lady-birds prey upon prune and other aphis. Upon their arrival I placed them in a breeding-jar with a piece of wet white silk. The lady-birds sipped some moisture from the silk and then clustered on the cover for the night. Next day they were given rose aphis, which they greedily devoured. As soon as the season comes around they will be placed in a prune orchard.

I have to report that the colonies of *Vedalia cardinalis* sent through the courtesy of your Board to Professor H. A. Gossard, of Lake City, Florida, and others in that State, have been wonderfully successful in checking the "cottony cushion scale" (*Icerya purchasi*). A comprehensive bulletin was issued by Mr. Gossard, giving a history of the unfortunate introduction of that pest into Florida, its spread through their orange groves, and of its subjugation by the *Vedalia*. We still keep up a stock of the four species of introduced lady-birds that prey upon this scale, viz.: *Vedalia cardinalis*, *Novius koebelei*, "*Black Vedalia*," and *Novius bellus*. The first two were introduced by Albert Koebele, and the other two by George Compere.

An outbreak of "cottony cushion scale" occurred in Guaymas, Mexico, and at the request of a citizen of Los Angeles a colony of *Vedalia* was sent to check this scale.

Hon. Teodoro Schneider, Commissioner of Chili to the Pan-American Exposition at Buffalo, visited this State at the request of his government, and we furnished him, through the kindness of William Barry, of Niles, with strong colonies of *Rhizobius toowombæ* and *Rhizobius ventralis*, which he took to Chili via New York.

In order to check the destructive introduced pests of the fruit trees, you have sent two experts to Australia, at different times, to find the natural enemies of these pests and to introduce them into California.

One of these pests that the experts were especially requested to give close attention to was the red scale (*Aspidiotus aurantii*). Australia and adjacent islands had been twice searched by Mr. Koebele and once by Mr. Compere. Several species of lady-birds that prey on this scale were collected and forwarded by them, but no true parasite was found in those countries. Mr. Compere was also directed by you to visit the Orient. At Hongkong he found evidences of internal parasites in the "red scale." He could find no suitable tree there to send to California, so, in spite of the "Boxer" trouble in China, he ventured into that country and succeeded in finding a small orange tree slightly infested, and on which he observed the small chalcid flies depositing their eggs in the scales. He purchased the tree, carefully dug and boxed it, and shipped it to San Francisco. In its native place the ground was overgrown with a dense crop of weeds that covered the stem for a foot or more. The portion so covered was badly infested with red scale, as they were protected from the parasites by the weeds. The tree arrived in San Francisco on November 21, 1900, and was placed in a glass breeding-case. The scales hatched on the base of the stem and soon infested the upper portion of the tree and leaves. I did not expect that any parasites would appear before June, as most of the internal scale parasites generally begin to issue about that time. On May 31st, six parasites appeared. None in June, 36 in July, 81 in August, 143 in September, and 381 in October, making a total of 647. These have been liberated in red scale infested orchards in Los Angeles and Orange counties. Owing to our removing the parasites as soon as they are developed, the scales are quite plentiful upon the imported tree. The parasites are hardly noticeable to the naked eye, as they are slightly smaller than *Aspidiotophagus citrinus*, the internal Japanese chalcid parasite of the "yellow scale," which has practically stamped that scale out of Los Angeles, Riverside, and San Bernardino counties. Professor Charles P. Lounsbury, of Cape Colony, is an enthusiastic believer in the value of beneficial insects, and on page 26 of his report as Government Entomologist for 1900, referring to the red scale, which is also a pest with them, he says: "The Californians have always believed that the scale originated in Australia, as they are confident that it reached their State from there, but now that they have had that land searched in vain for natural enemies, they may turn their attention to the south of Europe. We hope so." This is a fervent wish, but our little chalcid friend has come from the other side of the world. An encouraging feature of these parasites is the fact that they prefer the scales before they have reached the stage where they reproduce their kind.

With the exception of the "cottony cushion scale," internal parasites have been the means of subduing or keeping in check most of our serious introduced scale insect pests, among which may be mentioned the following: The "yellow," by *Aspidiotophagus citrinus;* the "soft brown," by *Coccophagus lecani* and *Encyrtus flavus;* the "brown apricot," by *Comys fusca;* the "San José," by *Aphelinus fuscipennis;* the "mealy bugs," out of doors, by *Rileyia splendens;* the "cottony grape scale," by *Encyrtus flavus.*

Let us hope that the Chinese parasite of the red scale will prove equally successful.

December 6, 1900.

To the Honorable the State Board of Horticulture:

Gentlemen: I herewith submit my report for the months of December, 1900, to April, 1901, inclusive.

During this time we have found plants, trees, or fruit upon 95 steamships and sailing vessels from foreign countries and also from the Hawaiian and Philippine Islands.

The receipts consisted of 369 cases, boxes, and bales of trees and plants; 97 loose lots of plants, numbering from one to a dozen in each lot; 10,386 boxes of citrus fruits, principally limes and Japanese oranges; 2,848 boxes of miscellaneous fruits; 7,373 boxes of tomatoes from Mexico and Honolulu; 5,598 crates and sacks of onions from Australia.

The above were carefully examined, and when found infested with insects or diseases not already found in the State, were destroyed, and when necessary all other stock has been fumigated with hydrocyanic acid gas.

Four new steamship lines are running now between San Francisco and Central and South America, calling at the principal ports en route.

On April 5th, the steamship "Arequipa" arrived from Valparaiso via Mexican ports, and had two baskets of oranges as the ship's stores. These I found infested with Mexican orange maggots (*Trypeta ludens*), and burned them in the ship's furnace. The Pacific Steam Navigation Company's steamer, "Peru," arrived on April 29th from Chili via Acapulco, Mexico, and had a bin of oranges from the latter port for use on board ship. Upon inspection I found that they were also infested with orange maggots. The tables were set for breakfast and the fruit on them was Mexican oranges. These I removed and burned with the others. From the size of the maggots in this and former lots destroyed, I am convinced that there are at least three broods of the pest during the time that the crop of oranges remains upon the trees.

During the summer of 1897, Mr. Albert Koebele visited Mexico in search of beneficial insects for the Hawaiian Government. Before his departure I requested him to secure for me preserved specimens of orange maggots and flies. He visited the State of Morelos five different times, and it was only upon his last visit, about the middle of October, that he found any infested oranges. Since then I have been informed that the flies only deposit their eggs upon ripe fruit. We have found oranges containing maggots in the months of December, November, February, and April. Each time we have found them in various stages, indicating several broods. This would be a serious pest in California, for our "Valencia Late" oranges are sometimes allowed to remain upon the trees for early fall shipments. We are in receipt of a communication from the Honorable A. L. Herrera, Chief of the Comision de Parasitologia, of the Mexican Government, requesting literature and information upon this orange pest, as his government intends commencing an energetic warfare against it. Orange maggots are now found as far north as the city of Chihuahua, in the border State of the same name.

In former reports I have referred to the small white destructive scale, *Diaspis amygdali.* On April 25th, the steamship "Nippon Maru" arrived from Japan and had one bundle of one hundred two-year-old flowering cherry trees for planting in Golden Gate Park, San Francisco. The trees were infested with the above scale, so were burned.

The scarcity of peach stock for the past three years in this State has caused planters and others to purchase such trees in the States immediately east of the Rocky Mountains. The trees were supposed to be grown in those States, but subsequent reports show that they had been grown farther east. The stock all arrived by rail and has been dipped by the county officials. Thousands of peach trees have been burned by the commissioners when found infested with the "black aphis" (*Aphis persica niger*), but unfortunately some lots have been allowed to escape, and this pest has obtained a foothold in several counties. Nearly all shipments arriving from the Eastern and Southern States are accompanied by certificates of inspection, signed by an official of the agricultural college or experiment station in the respective States, stating that the trees have been examined and found to be free from injurious insects, etc.. The inspectors have heretofore been instructed not to rely upon such certificates, because of the fact that nearly all inspection work in the Eastern and Southern States is done during the summer time, when the condition of the roots can not be ascertained. The above aphis also infests the roots of peach trees.

The danger of introducing the "white fly" (*Aleyrodes citri*) that has caused so much damage to citrus trees in Florida, really demands that some effective way of preventing its introduction into California be considered. Probably the most effective check for the present would be for the Supervisors of the various citrus-fruit-growing counties to adopt Riverside County's plan of passing an ordinance prohibiting the bringing of citrus trees from Florida. The danger of introducing this pest is greater than it is with the scale insects. In the early stages of their existence the *Aleyrodes* resemble scales, but they differ in the fact that the females are winged as well as the males. In a letter from a correspondent in Chili, he states that this pest has lately appeared in some of the orange trees of that country and is causing alarm. In writing about the "purple scale" (*Mytilaspis citricola*), he says: "This parasite has destroyed the greater part of the orange trees of the coast valleys of Chili," and adds: "The pecuniary loss to this country through the destruction of the orange trees is very great. To extirpate this pest every class of remedy has been tried, but with no effect so far."

On February 27th Professor Charles P. Lounsbury, Government Entomologist of Cape of Good Hope, South Africa, sent me a box of twigs and branches of myoporum and oleander, slightly infested with "black scale" (*Lecanium oleæ*), the box coming by way of England. From Cape Town it was sent in the cool chamber of the steamer to London, and from there to San Francisco by express. All charges were generously paid by the Cape Government. There was a most unfortunate delay when the box reached New York, as it was detained by the customs officials for invoice. On April 9th I received notice of its detention, and immediately telegraphed the facts to Dr. L O. Howard at Washington. He telegraphed the Government Dispatch Agent at New York, who had them promptly released and forwarded. Unfortunately, however, the box must have gone astray, for it did not reach me until April 23d. In consequence, all the myoporum was dried up and the scales dead. The oleander material was in a slightly better condition, and at this writing three of the chalcid parasites (*Aphycus lounsburyi*) have issued. This parasite appears to attack the half-grown "black scale."

On April 15th, at the request of Dr. Howard, a colony of *Vedalia cardinalis* was forwarded to Dr. Antonio Berlese, Scuola Superiore di Agricoltura, Portici, Italy, to check an outbreak of "cottony cushion scale" (*Icerya purchasi*) in that country.

In my report to you dated November 11, 1897, and published on page 102 of your Preliminary Report (Sixth Biennial), I referred to the sending of two colonies of lady-birds (*Vedalia cardinalis*) from this office, that checked the same scale in Portugal. This was also done at the request of the Department of Agriculture, Washington, D. C. We now have great difficulty in securing "cottony cushion scale" to feed our breeding colonies of the four species of lady-birds that prey upon that scale. Numerous applications have been received and the insects supplied, but in nearly every case very few scales were found. A year ago several serious outbreaks of this scale occurred in different counties, but these were soon checked by colonies of lady-birds sent from our breeding-jars.

I am pleased to report that the internal parasite, *Comys fusca*, has been successfully established in Tulare County upon the "brown apricot scale" (*Lecanium armeniacum*). This scale has caused alarm, especially among the prune-growers, owing to the great amount of honey-dew thrown off by the scales, and the subsequent growth of black smut injuring the growth of the trees and the quality of the fruit. Two years ago, and last year also, colonies were sent to prune-growers in the San Joaquin Valley. Among others, George A. Fleming, of Visalia, received a colony. I am just now in receipt of a box of scale-infested twigs from his orchard. The *Comys* are now issuing from the scales. A careful examination shows that fully ninety per cent contain parasites. This is at least fifteen days earlier than they hatch in Santa Clara and Alameda counties. George H. Cutter, County Horticultural Commissioner of Sacramento, has the *Comys* well established in his orchard, and is now placing them in other orchards in his county. The flies are now hatching from the scales sent to me by him. The scales that are parasitized produce no eggs, and are slightly smaller and of a darker color than the healthy scale at this time of the year. The female deposits a single egg in each scale about the time that the scales are three-fourths grown. The egg hatches into a small, blind, footless grub, destroying the scale and changing into the chrysalis under the scale. The winged parasite then cuts a hole through the top of the scale and makes its escape. If the orchardists who have received colonies of *Comys fusca* within the past two years will make an examination of the scales with a pocket lens, they will notice the exit holes in the scales if the parasites have established themselves.

Per the steamship "Sierra" that arrived February 10th, and the steamship Sonoma, March 18th, we received from George Compere two fine consignments of "red spider lady-bird" (*Scymnus vagans*), which he had collected in Australia. Mr. Compere writes in the highest terms regarding this minute lady-bird. Strong colonies have been sent to Alameda, Colusa, Fresno, Merced, Los Angeles, Santa Barbara, San Diego, Santa Clara, Contra Costa, Sacramento, and Yolo counties.

We have received no more internal parasites of the half-grown black scale (*Myiocnema comperei*, Ashmead), as Mr. Compere was unable to again visit Brisbane, Queensland. In a letter from Mr. Compere, dated Sydney, February 26, 1901, he writes: "Since writing you last I made a trip to West Maitland, and on the way I remained over two days at Newcastle, there being plenty of oleander trees there and plenty of olive trees at Maitland. I expected to have no difficulty in finding 'black scale,' but was mistaken, for at both places the same condition prevailed as at Merickville, with the same parasites present, and hand picking of the scales was the best that I could do."

In another letter dated March 26, 1901, he writes: "The parasites on the eggs of the black scale are in many respects the same as our *Dilophogaster*, but I think are going to be more effective. I found a plant from which I picked thirty-eight scales, every one on it, and each contained a maggot."

Those parasites reached us in good condition and have been developing from that and subsequent sendings, so that we have been enabled to send colonies into districts where conditions are suitable for their successful colonization. Specimens were sent to Dr. L. O. Howard. It was found to be a new species, and on the suggestion of Dr. Howard, Mr. Ashmead named it *Hemencyrtus crawii*, Ashm. Ten colonies were sent to Santa Clara County and liberated upon black scale; seven colonies to Los Angeles County; two colonies to Santa Barbara; two to Alameda; two to Ventura; one each to San Diego and Monterey counties. Mr. Compere has also forwarded two new species of internal parasites of aphis that arrived in good condition and were liberated in Alameda and Santa Clara counties, as these counties were convenient and delay would have proved disastrous to such small insects.

On Sunday, February 10th, the steamship "Sierra" arrived from Australia, and had in the cold-storage room a box of dead grasshoppers containing chrysalis of the internal dipterous parasite, *Homolomyia canicularis*, collected in Australia by Mr. Compere. The box was again placed in cold storage in this city in a room where the temperature is kept at from 35° to 40°, and will remain there until June, when our grasshoppers are plentiful. We will then place the dead hoppers in a slightly warmer temperature so that the flies will develop, when we will liberate them in various districts of the State where grasshoppers are destructive. Two more boxes arrived on Sunday, February 24th, per steamship "Alameda," and were placed in cold storage with the others.

It was impossible for me to again visit Livermore Valley, after liberating fifty-nine healthy parasites on the 14th of last June, and referred to on pages 66 and 67 of your Seventh Biennial Report. The conditions were very favorable at that time, so I hope the parasites got a start.

MAY 15, 1901.

To the Honorable the State Board of Horticulture:

GENTLEMEN: I herewith present a synopsis of my semi-annual report as Horticultural Quarantine Officer and Entomologist.

Since my last report 105 steamships and sailing vessels have entered the port of San Francisco having trees, plants, or fruit on board from the following countries: China, Japan, Australia, New Zealand, Pacific and South Sea Islands, Mexico, Central and South America, and Philippine Islands.

As formerly, the greatest number of trees and plants came from Japan. The imports from all parts by sea consisted of 789 cases, boxes, bundles, and loose lots, and 6,855 cases and boxes of miscellaneous fruits. As heretofore, no plants that were even slightly infested with insects new to the State have been permitted to pass ashore.

I desire to call attention to the great development of the trade in fresh tomatoes between Mexico and the United States during winter and spring, and to the possibility of portions of California supplying the demand. We have districts that are practically exempt from frost, and if tomato plants were well established with half-grown tomatoes before cold weather and then slightly protected, the tomatoes would mature during the winter and spring, when prices are high. Nearly 13,000 twenty-pound boxes came in this season that averaged $2.50 per box.

We occasionally find a melon in the possession of passengers or crews from Honolulu, which we destroy. No melons, cucumbers, or summer squash have been received as freight from Honolulu since we destroyed the shipment that arrived on February 28, 1899, on the steamship "Australia," infested with the melon maggots (*Dacus cucurbitæ*). In Honolulu this pest destroys seventy-five per cent of their crop. It is not found in North America.

The steamship "Tucapel" arrived on December 19th from South American ports via Acapulco, Mexico. In her stores I found some Mexican oranges, and in the presence of Captain Moffatt I cut several apparently sound oranges and found them infested with the Mexican orange maggot (*Trypeta ludens*). The captain declared he would never purchase or again eat a Mexican orange.

On March 19th, the steamship "City of Para" arrived from Central American and Mexican ports. A passenger had a basket of "sweet limes" that were infested with orange maggots, and the fruit was immediately burned. This pest never attacks any sour fruit, such as lemons or limes.

I learned more regarding the fifteen cases of oranges that arrived from Acapulco per steamship "Palena" on Sunday, November 24, 1901. The fruit was cremated, as it was infested with orange maggots. On a subsequent steamer the owner and shipper of the oranges arrived, and informed me that he had the oranges carefully picked and inspected two weeks before shipping. Before packing, the fruit was again inspected and he thought it entirely free from maggots. He went to all that care and trouble, as he intended, if that lot was successful, to go extensively into the shipment of early oranges.

In January the U. S. A. transport "Kilpatrick" arrived from Manila. An army contract physician, J. B. Hallwood, brought a mongoose as a pet. After a great deal of technical opposition and appeal on his part to Collector of Customs F. S. Stratton, and the Department of Agriculture, Washington, D. C., I was sustained, and finally chloroformed the animal.

A somewhat unique importation arrived on the steamship "America Maru" on December 27, 1901, from Japan. It was a willow tree twelve feet high and branched in proportion to height. It was intended as a New Year or Christmas tree, for the Japanese community. As it was infested with a new species of *Chionaspis* scale insect, it got no further than the dock.

On April 24th, a large hibiscus was brought in on the steamship "Argyle" from Panama; it was covered with a new *Chionaspis*, and it was also destroyed.

On December 29, 1901, the steamship "San José" arrived. A passenger had a gardenia from San Blas, Mexico, infested with "mining scale" (*Howardia biclavis*), and it was destroyed.

From coniferous trees imported from Japan we breed "saw flies" and Tortrix moths. The larvæ of the former were destroying the leaves of pine trees, and the caterpillars of the latter were feeding on the foliage of biotas. I submitted the specimens to Dr. L. O. Howard, of Washington, D. C., and in reply he wrote: "The saw-flies have been examined by Mr. Ashmead, who states that they belong to the genus *Monoctenus;* but no specimen of this genus has been recorded from Japan, unless Konow has described some since Dalla Torres catalogue was published two or three years ago. Your specimens are different from anything in the National Museum collection. The Tortricid moths are unnamed."

Last year I was informed by one of the large almond-growers that a number of his almonds were damaged by worms eating into the nuts. At the time he could not find any of the insects. I requested him to keep watch of the trees this spring when the nuts were set. On April 26th, he sent me a package of those he saw were attacked. Upon examination, I found the worms to be the larvæ of the old time "peach-twig borer" (*Anarsia lineatella*). To prevent any damage by this moth, the orchard should be sprayed, before the trees start in the spring, with a solution that will penetrate the burrows of the small larvæ that work in the spongy bark during winter. A wash of lime, sulphur, and salt is preferable, as it is also a good check to the red "clover mite" (*Bryobia pratensis*) and leaf fungus.

On April 15, 1901, at the request of Dr. L. O. Howard, I sent a colony of thirty-six larvæ of *Vedalia cardinalis* to Dr. Antonio Berlese, Scuola Superiore di Agricoltura, Portici, Italy. In less than a year this sending exterminated the "cottony cushion scale" that was established there.

At the request of Mr. Lionel Hanlon, of Auckland, New Zealand, I sent him about two thousand of our native aphis-feeding lady-birds, *Hippodamis convergens*. In a letter Mr. Hanlon informed me that the beetles reached him in splendid condition; they were collected and packed at Mountain View, by Edw. M. Ehrhorn.

The Hungarian lady-birds, *Coccinella septempunctata*, received from Dr. Howard, increased and were liberated on prune aphis in Santa Clara and Alameda counties. Part of the second generation is now depositing eggs in the breeding-jars in the office.

The Italian moth cocoons, *Erastria scitula*, and enemy of the "black scale," received by Dr. Howard from Italy and sent to us for propagation, developed and were sent to Los Angeles, Alameda, and Santa Clara counties. While they are not as rapid breeders as the South African parasite, *Scutellista cyanea*, still all help to reduce the numbers of that scale pest of citrus, olive, and apricot orchards.

I am pleased to report the successful propagation of the seventeen *Scutellista cyanea* received from Prof. Charles P. Lounsbury, Government Entomologist of Cape Town, on October 31, 1901. Four were females; but unfortunately one was killed by a small spider concealed in a curled leaf. This left us but three females to undertake the colonization of this valuable insect in the extensive orchards of California. We have been so far successful that two generations of California-bred *Scutellista* have been liberated and we are now breeding the third generation indoors. As the climate of San Francisco is not as favorable for this work as is that of the fruit-growing counties, I believe we could have had at least another generation in the same time. This is a most encouraging feature in the life history of this insect, as our native internal parasite (*Tomocera californica*) has but one generation a year and never more than seventy-five per cent of the scales are destroyed by it, leaving twenty-five per cent of the scales alive, each containing from 1,500 to 2,000 eggs. On one of the trees colonized with *Scutellista* not a scale escaped to bring forth its young. In South Africa it is difficult to find "black scale," owing to this parasite. Colonies of *Scutellista* have been placed in orchards in Alameda, Santa Clara, San Diego, and Santa Barbara counties, as the conditions in each were considered most suitable to establish breeding centers.

Regarding the internal parasite (*Comys fusca*) of the "brown apricot scale" (*Lecanium armeniacum*), we have received very encouraging letters from growers where this parasite was placed two and three years ago. The prune, apricot, and other trees that formerly were covered with this scale and black fungus are now clean and bright. We sent out thousands of *Comys* in June, through the central, coast, and bay counties, where this scale has been troublesome.

It has been like trusting in a miracle for some growers to abandon all artificial methods and rely upon a few dozen tiny parasites sent to each applicant to clean up the scale. Owing to climatic conditions this season, the *Comys* was about three weeks late in developing to the winged form.

Rhizobius ventralis, the Australian "black lady-bird," is working into favor in some districts where it formerly appeared to be a failure. In the San José and Mountain View districts, Edw. M. Ehrhorn, the Horticultural Commissioner, gives the *Rhizobius* full credit for having cleaned up several orchards of "black scale" (*Lecanium oleæ*). On a recent visit I found the lady-birds were still present in small numbers and the scale very scarce. In a letter from John Scott, of Duarte, Los Angeles County, dated June 30, 1902, referring to this lady-bird, he writes: "You must know that although I never anticipated the great things from the *Rhizobius* that you and the State Board did, I always had hopes that if a supply was constantly kept up in one district they would eventually become acclimated and be of good service. On these lines I have quietly worked and have placed colonies in the same trees every year, some years as many as five colonies. Up to this year I have never been able to find a single beetle after a few days. Now I am pleased to be able to say that I can find larvæ and mature lady-birds in every tree on my place where 'black scale' is to be found. I don't want to be too sanguine, but I *do* think they will clean me up this year. Knowing your interest in these matters I thought these facts might interest you."

Mr. Scott was for five years Horticultural Commissioner of Los Angeles County, and well knows the tenacity of the "black scale," and the expensive battles he and other orange, lemon, and olive growers have waged against that pest.

The "black scale," like some other of our orchard pests, is an imported species, and but few of our native beneficial insects make much headway against it. Your policy of introducing and fostering all insects that prey upon it, is unquestionably the proper course, and it looks as if relief is at hand in the near future.

JUNE 30, 1902.

To the Honorable the State Board of Horticulture:

GENTLEMEN: As usual, during the summer months, the number of vessels arriving in the port of San Francisco from foreign ports, having plants on board, has been light. But eighty-one steamers and sailing vessels were found to contain such stock since my last report. A very marked improvement was noticeable in the character and cleanliness of the trees, plants, and fruits that have been received. This would indicate a more wholesome regard for our State laws and the regulations of your Board relating to such imports.

One hundred and ninety-six cases, boxes, bundles, and loose lots of trees and plants, and six thousand three hundred and twenty-eight crates and boxes of fruits were received. As heretofore, no plants or fruit showing even slight infestation with insects new to the State have been permitted to enter.

The stewards and other employés upon vessels trading between San Francisco and Acapulco and other Mexican ports have been notified not to bring any oranges or sweet limes. All such fruits found in the baggage or possession of passengers from there is confiscated and destroyed, to guard against the introduction of the disgusting Mexican orange maggot.

Early in November, some interested individuals caused to be telegraphed throughout the United States statements that the Mexican oranges are now free from infection by maggots, and in proof thereof stated that Californians had raised the embargo and that carloads of Mexican oranges had been shipped direct to California. No such shipments had come under my observation, but in order to ascertain positively if any had been received or brought into the State, I called upon the head traffic agents of the Southern Pacific Company and was assured that no oranges had or would be accepted by their agents; in fact, no rates upon oranges between Californian and Mexican points had been made, as they could not afford to jeopardize this important California industry. Cars that have been used in hauling Mexican oranges to the Eastern States, they informed me, are treated with live steam as soon as the cars are unloaded, so as to kill any maggots or pupæ that may be therein. This was also done last year in compliance with a request made by your Board.

We still have the valuable assistance of the customs officers in preventing the surreptitious landing of plants and fruit. This is of incalculable benefit, not only to California, but also to the entire United States. We are also notified of the arrival of plants by rail, and also by mail from foreign countries and our island possessions.

When in Orange County last August, I found an extensive nursery of small *trifoliata* orange trees, that had been purchased in Florida. The ground had just been irrigated, so was wet and muddy and in bad condition to make an inspection of the trees. The importation of citrus trees from Florida is attended with very great risk of introducing the destructive "white fly" (*Aleyrodes citri*). Official information regarding this pest in that State is as follows: "White fly is so generally distributed as to render restriction measures impractical." I requested County Horticultural Commissioner Nebelung to make a careful monthly tree-to-tree inspection of that nursery. Not a single citrus tree should be brought from Florida, or adjoining States, while there is danger from that filthy pest.

In my last report I referred to the successful importation of the South African black scale parasite, *Scutellista cyanea*. It has increased beyond our most sanguine expectations and is doing splendidly where it has been liberated in orchards. I have referred to this parasite more fully in a paper, "Parasitic and Predaceous Insects in the Orchards," to be read at the Twenty-seventh Fruit-Growers' Convention. The most desirable season to widely distribute this parasite of the black scale would be in the months of April, May, and June. To accomplish this, it will be necessary to have a larger insectory for breeding purposes. It is more satisfactory to have them under daily observation, so that they can be forwarded to the orchardists as soon as they develop.

At the request of the United States Department of Agriculture, we have sent colonies of *Vedalia cardinalis* to Bermuda, British West Indies, and to Tahiti, Society Islands.

Since our last report we have sent out colonies of the following parasites and beneficial insects: *Vedalia cardinalis*, "*Black vedalia*," *Novius koebelei*, *Novius bellus*, *Rhizobius ventralis*, *Coccinella septempunctata*, *Comys fusca*, *Coccophagus lecani*, *Aspidiotophagus citrinus*, *Encyrtus flavus*, and other more common species.

I am sorry to report that on my visit to Anaheim, I found all the orange trees had been cut down where the greatest number of the Chinese parasite for the "red scale" were liberated. This was a most unfortunate affair, as the trees were in a good neighborhood for such an experiment, and I was assured that they would be allowed to remain, to thoroughly test them. Fortunately, several smaller colonies were placed in other orchards.

Early in September, Dr. W. B. Wall, the well-known orange-grower of Santa Ana, sent me parasites he had bred from red scale. Upon an examination, I found them to be the "golden chalcid fly," referred to on page 221 of your report for 1891. Dr. Wall states that they are very numerous and are reducing the red scale. Roy K. Bishop, of Orange, and others, write favorably regarding it. This parasite was formerly found only in districts where the "yellow scale" (*Aspidiotus citrinus*) prevailed. Other growers have written favorably concerning this parasite.

To guard against the introduction of asparagus rust, you passed a resolution prohibiting the importation of asparagus seeds or plants into the State. Unfortunately, the disease has obtained a lodgment in several of the southern counties, from seed purchased in the Eastern States. It is but six years ago since it was first introduced into the United States. Every effort is being taken by the County Horticultural Commissioners to have it stamped out. Unless this is thoroughly done, it will be a serious blow to asparagus culture in California. No remedy is known for this disease, and the safest way to stop its further spread is to cover the plants with combustible material and burn them.

In my annual visit through the southern counties last August more than usual interest was taken in methods to check red spider and other mites, as fumigation and sprays have not been altogether satisfactory in citrus orchards. During the summer, I had an orange tree in a glass case for propagating scale parasites, but, notwithstanding the fact that the tree was sprayed every day with clear water, the red spider increased and damaged the tree by eating the chlorophyl of the leaves. I was afraid to use the usual remedies for spider, on account of the parasites, but either the spiders or the tree had to go. I gave the latter a thorough dusting with powdered sulphur, and two days afterward not a spider was to be seen, and the tree has remained clean since. The astonishing and encouraging feature of the case is the fact that the treatment has not, in the slightest, interfered with the propagation of the parasites, as they have gone on breeding regularly. Your Board has always strongly advised the free use of sulphur in deciduous orchards and vineyards, but our orange and lemon growers can also use it to great advantage. The increase of the spider, under conditions that have always been considered disastrous to them, is hardly credible. The construction of the case was such that the spray could only be applied from above, still that is the direction that the rain strikes the trees; besides, the humidity remained in the case all night.

Correspondence and inquiry relating to insects and horticultural matters have been extensive.

Respectfully submitted.

ALEXANDER CRAW,
Quarantine Officer and Entomologist,
State Board of Horticulture.

NOVEMBER 29, 1902.

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YUBA COUNTY—

W. B. Meek, chairman	Camptonville.
Geo. W. Harney, secretary	Marysville.
John King	Wheatland.

CALIFORNIA HORTICULTURAL QUARANTINE GUARDIANS.

ALAMEDA COUNTY—

William Barry, Niles, and Alameda County at large.
W. O. Webb, Haywards, and Alameda County at large.
A. D. Pryal, Temescal, and Alameda County at large.

BUTTE COUNTY—

George B. Springer, Butte County at large.
George F. Ditzler, Butte County at large.

CONTRA COSTA COUNTY—

W. J. Westlake, Martinez, and Contra Costa County at large.

FRESNO COUNTY—

J. E. Mitchell, Sanger, and Fresno County at large.
W. M. Scott, Fresno, and Fresno County at large.
W. D. Weaver, Fresno, and Fresno County at large.

HUMBOLDT COUNTY—

R. W. Hutchins, Humboldt County at large.

KINGS COUNTY—

H. W. Byron, Lemoore, and Kings County at large.
James A. Hill, Hanford, and Kings County at large.
J. E. Tilton, Armona, and Kings County at large.

LAKE COUNTY—

S. Graham, Lake County at large.

LASSEN COUNTY—

F. J. Winchel, Lassen County at large.

Los Angeles County—

O. R. W. Robinson, Los Angeles, and Los Angeles County at large.
J. W. Jeffrey, Azusa, and Los Angeles County at large.
S. Strong, Norwalk, and Los Angeles County at large.
Andrew T. Garey, City of Los Angeles, and Los Angeles County at large.
George W. Frazier, City of Los Angeles, and Los Angeles County at large.
William H. Payne, Monrovia, and Los Angeles County at large.
Charles L. Northcraft, Pomona, and Los Angeles County at large.
Charles A. Day, Pasadena, and Los Angeles County at large.
W. B. Owens, Glendora, and Los Angeles County at large.
George W. Taylor, Downey, and Los Angeles County at large.

Madera County—

C. M. Petty, Madera, and Madera County at large.

Mendocino County—

J. R. Banks, Mendocino County at large.

Merced County—

N. H. Wilson, Merced County at large.

Monterey County—

D. W. Rohrback, Monterey County at large.

Orange County—

I. N. Rafferty, Santa Ana, and Orange County at large.
A. D. Bishop, Orange, and Orange County at large.
M. Nebelung, Anaheim, and Orange County at large.

Placer County—

John Adams, Placer County at large.

Riverside County—

R. P. Cundiff, Riverside County at large.
W. F. Budlong, Riverside County at large.
H. H. Holmes, Riverside County at large.

Sacramento County—

George H. Cutter, Sacramento County at large.

San Diego County—

Chester Gunn, San Diego County at large.
George P. Hall, San Diego County at large.
F. Austin, San Diego County at large.

SAN BERNARDINO COUNTY—

Robert Bosworth, San Bernardino County at large.
R. T. Curtis, San Bernardino County at large.
J. S. Fink, San Bernardino County at large.

SAN JOAQUIN COUNTY—

R. S. Davis, San Joaquin County at large.

SANTA BARBARA COUNTY—

T. N. Snow, Santa Barbara County at large.

SANTA CLARA COUNTY—

Ed. M. Ehrhorn, Santa Clara County at large.

SANTA CRUZ COUNTY—

J. H. B. Pilkington, Santa Cruz, and Santa Cruz County at large.
F. W. Hitchings, Corralitos, and Santa Cruz County at large.
C. H. Rodgers, Watsonville, and Santa Cruz County at large.

SHASTA COUNTY—

G. A. Lamiman, Shasta County at large.

STANISLAUS COUNTY—

J. N. Stuhr, Stanislaus County at large.

SUTTER COUNTY—

H. P. Stabler, Sutter County at large.

TEHAMA COUNTY—

A. W. Samson, Corning, and Tehama County at large.

TULARE COUNTY—

P. D. Fowler, Tulare County at large.
C. S. Riley, Tulare County at large.
S. A. Baggs, Tulare County at large.

VENTURA COUNTY—

J. F. McIntyre, Ventura County at large.

YOLO COUNTY—

J. W. Anderson, Yolo County at large.

YUBA COUNTY—

G. W. Harney, Yuba County at large.

REPORTS

OF

COUNTY BOARDS OF HORTICULTURAL COMMISSIONERS.

REPORTS OF COUNTY HORTICULTURAL COMMISSIONERS.

ALAMEDA COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: I herewith respectfully submit my annual report as Horticultural Commissioner of Alameda County for the year ending October 1, 1902.

The season for the handling of nursery stock commenced November 18, 1901, and continued until May, 1902. The absence of insect pests has been remarkable. Thousands of young olive trees can now be seen at the California nursery, bright and clean, whereas two years ago they were black with smut; this has been brought about by the effective work of that valuable insect, *Rhizobius ventralis*, assisted by the internal parasite, *Dilophogaster californica*. The brown apricot scale (*Lecanium armeniacum*) has been nearly cleaned out of the orchards by the internal parasite, *Comys fusca*.

There has not been any spraying in this district since 1893, as we have depended entirely on the natural enemies of the different scales, as above.

The output of nursery stock has been up to the average, while that of ornamental stock has been far above the average, and the handling thereof has been much more satisfactory on account of their cleanliness.

Last May I received from Mr. Craw, State Quarantine Officer, a few colonies of *Scutellista cyanea*, the South African internal parasite of the black scale, and have succeeded in establishing them in the olive and orange grove of H. A. Mayhew at Niles. On September 18th I cut a few twigs of the olive and orange, and up to date, out of four small jars, have succeeded in hatching out fifty-three, showing a very gratifying result.

The fruit crop of all varieties has been abundant, but prices have ruled low, especially for peaches. Many of the orchardists have concluded to get rid of their peach trees, as the returns have been far from satisfactory.

Again, I am sorry to have to report the presence of the disease, *Monilia fructigena*. The loss this year in apricots, especially in Moorpark, in this part of Alameda County from this cause will foot up nearly one hundred and fifty tons. The earlier varieties seem to escape the disease to a certain extent. I see by written reports that it has also appeared in Santa Cruz County.

Respectfully submitted.

WILLIAM BARRY,
Commissioner.

CONTRA COSTA COUNTY.

To the Honorable the State Board of Horticulture:

Gentlemen: In the central district of Contra Costa County the conditions, so far as the growing of fruit is concerned, are fairly good, considering that the rainfall for the last four years has been short of the usual quantity. This has been largely, but not entirely, compensated for by increased attention to thorough cultivation, and, in a few instances, to winter and early spring irrigation from the mountain streams which flow into our valleys.

Good work is being done by the orchardists in the way of spraying to lessen the ravages of the codling-moth in apple and pear orchards, and when properly done by experienced men, a large degree of success rewards their efforts.

Black scale is not as numerous as it was a year or two ago. This is partly due to spraying with kerosene emulsion, and partly, I think, to the thousands of robins that feast on the scale during the winter months when the snow on the mountains forces them to come down into the valleys to secure food.

For the red spider on the almond trees we have tried spraying with the salt, sulphur, and lime mixture; also with caustic soda, made so strong as to kill the small twigs; both were used in winter when the trees were dormant, and both proved failures, so far as eradication is concerned. The number of mites was reduced so little as to leave doubt as to whether the benefit was worth the expense.

We next tried the application of dry sulphur in midsummer, giving the trees three separate dustings, at intervals of two weeks. This, we think, has done some good, but how much we shall not know until next spring.

In the matter of phylloxera, there are some isolated cases in this district. In such cases the destruction of all affected vines and the planting of resistant stock are urged.

In the eastern district of Contra Costa County the conditions, so far this season, have been good for the fruit-growers, considering the scarcity of rain; but by constantly cultivating the soil in the spring the ground retained its moisture and abundant crops of peaches and apricots were gathered. The climate is too warm for apples.

In regard to insects, the worst we have is the red spider on the almond trees; but by spraying with lime, sulphur, and salt, and a frequent dusting with dry sulphur, it is held in check.

We have very few grapes in this locality. The Tokay is the principal variety, and is a very heavy bearer. Resistant stock is being planted.

Raising almonds in this locality has become an important industry. Land that was, a few years ago, covered with brush, is now covered with almond orchards, and the trees look fine and healthy.

The black scale in this locality does not thrive, as the climate is too warm; but when found, spraying well with kerosene emulsion is sure to kill it.

Respectfully submitted.

J. F. BUSEY,
A. M. GRAVES,
Horticultural Commissioners.

FRESNO COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: The Horticultural Commissioners of the county of Fresno submit herewith their report for the year 1902.

The fruit industry of the county has never before been more flourishing than during the present season. The raisin crop amounted to about 4,800 cars of ten tons each, besides making about 4,500,000 gallons of wine and brandy. We had a large crop of all kinds of dried fruits, with the exception of pears, which were very badly blighted. Our green fruit shipments were light, owing to our small crop of pears, aggregating only about 165 cars.

No subject in fruit culture has attracted so much attention in recent years as the successful production of the California Smyrna fig, called Calimyrna by the originator, George C. Roeding, who has maintained an orchard of sixty acres for fourteen years without deriving any revenue from it. After making many unsuccessful attempts to introduce the wasp, he finally succeeded, with the assistance of the U. S. Department of Agriculture, in establishing, in 1899, this wonderful little insect, the *Blastophaga grossorum*, in his Wild or Capri fig trees. The insect thrived and increased in numbers at a rapid rate, and in 1900 a crop of six tons of California Smyrna figs was harvested, which were pronounced by experts and prominent horticulturists throughout the United States to be of a far superior flavor and sweeter than the imported article. This was the first crop of Smyrna figs ever produced in the United States, and in fact in the world outside of Smyrna, and it demonstrates conclusively that this industry has a great future in this State and in other States with a climate similar to our own, in spite of the many theories which had been advanced that this fig could be grown in Smyrna alone. The crop for the season of 1901 was forty tons, and that of 1902 was fifty tons, and will no doubt be much larger next year, as the little wasp is now thoroughly acclimated and has withstood as low a temperature as 20° F. above zero without injury.

Olive culture is making its way to the front. There are 16,394 bearing trees and 21,060 non-bearing trees in orchards, and a great many more will be put out this season.

The citrus fruits from this section are remarkably early and free from smut, scale, and all insect pests. These fruits are also attracting much attention, especially along the Sierra foothills in this county. In what is known as the thermal belt, there were about 300 acres planted to oranges and lemons during 1902.

There was also a very large acreage put out to wine grapes this season. The planting of deciduous trees is mostly confined to peaches and pears.

The orchards of the county are, generally speaking, well cared for and reasonably free from disease and insect pests, with the exception of pears, which were badly blighted.

The Commissioners look forward to the coming year with confidence and gratification for the stimulus given the industry during the last few years.

The future is bright indeed.

Respectfully submitted.

W. D. WEAVER,
Secretary.

HUMBOLDT COUNTY.

To the Honorable the State Board of Horticulture:

Gentlemen: Pursuant to requirements, we submit herewith the annual report of the Humboldt County Board of Horticultural Commissioners.

Apples are as yet the only fruit produced in commercial quantities in this county. The general condition of orchards may be termed satisfactory, with continued increase from new-bearing settings. To some extent the neglect, abandonment, and final destruction of old orchards have offset a portion of the natural increase in yield, but with the added care being bestowed and the importance of constant attention, which this Board has impressed upon all orchardists, the prospects for increased yield of first-class quality are very promising.

This section has been fortunate in escaping to a great extent any serious damage from scale of any kind. Along the belt lying in proximity to the coast, the weather conditions are such as to retard any rapid development of San José or any other pernicious scales, and consequently there is, with the exception of oyster scale, hardly any to be found. Fungous growths are more noticeable, and those which affect the fruit itself show their effect in producing scab which attacks certain varieties every season. The beneficial results of proper spraying for this trouble are being recognized, and the Bordeaux mixture has of late been applied with good success.

In the warmer belt removed from the coast, San José scale existed to a limited extent for a number of years, and during the past few seasons developed quite rapidly, threatening several orchards with complete destruction. Owing to limited transportation facilities, most of these orchards have not been sufficiently profitable to encourage the necessary attention required, and this has contributed to the increase of this pest. At the same time, it has demonstrated the absolute necessity of remedial measures to prevent destruction, and these have been applied more thoroughly during the past six months than at any previous time.

Codling-moth is virtually unknown in this county, although it exists in one orchard in the Mattole section to the south, and in Orleans and Trinity to the north—both away from the coast line. Hardly any of the fruit from either of these sections comes to market, and for some time local inspectors have been instructed to prevent its passing beyond a given line.

This freedom from infection of most all kinds probably makes Humboldt apples the cleanest and healthiest that reach the market from any given section in this State, and the preference manifested wherever they have become known promises increased demand.

Owing to the lateness of seasons here, considerable fruit is imported from other sections, including early apples, peaches, plums, etc., until summer is well advanced. All of this has to pass examination by the local inspectors. This season the regulations have been applied more stringently than ever, and much has been condemned which was reported as having passed quarantine at other points. The same rule applies to fruit coming to Eureka from other parts of the county.

Respectfully submitted.

J. E. JANSSEN,
Secretary.

LASSEN COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: The County Board of Horticulture of Lassen County submits the following:

The orchards of this county have yielded a good average crop. Our fruits are limited to the hardy varieties, such as the apple, pear, peach, plum, prune, etc., together with almost all kinds of berries. Our main fruit crop, however, is the apple, to which our climate and soil seem specially adapted, as the quality can not be excelled anywhere. The pest known as the codling-moth has done, and is still doing, this business serious damage. We are hoping and think that the Hazelton moth-trap, or some similar device, will be the means of destroying this pest. Where this trap was used continuously during the season of the moth's active work, the result seemed to merit its recommendation.

Respectfully submitted.

I. N. JONES,
President.

MADERA COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: I beg leave to submit to your honorable body the following report of the fruit interests in our county:

Through the courtesy of Professor Bioletti and his valuable assistance, we made a thorough examination of all the vineyards in this county for phylloxera. After a thorough search, none was found, nor any evidence of its presence in any of our vineyards. I accompanied the professor to Fresno on the same errand. With the assistance of Mr. Scott, the Horticultural Commissioner of Fresno, I was enabled to have a map made of the infested district of that county. I have furnished one of these maps to each of the wineries and requested them to refuse to buy from within certain lines. Mr. Rossi, President of the Italian-Swiss Colony Vineyard, and Mr. Minturn, of Minturn Vineyard, both in this county, assured me that they would gladly accede to my request, thereby obviating the necessity of more stringent measures to prevent the influx of this terrible pest.

The San José scale has secured a strong hold in our county in several places. While we have done much to eradicate it, we find many of the orchardists rebel at being served with notices to spray; but I have yet to find, after understanding the good that will accrue from spraying, one who will object, and in fact, the most stubborn, after they have sprayed once, are our best supporters.

Every package of trees or vines delivered at any station in this county has been examined for insects, and many of them were processed to eradicate the same. We have found carbon bisulphide the most effective in this work.

Under the instructions of Alexander Craw, who has given us many valuable remedies for the several insect pests, we have been able to accomplish much. Being new at the business, we find the advice of such experienced gentlemen very valuable.

We have received reports for publication from the Experiment Station at Berkeley, on specimens sent by us from time to time, which have been very beneficial to horticulturists of this county. These reports have been thorough and to the point. With such assistance one need have no trouble in determining the cause of an orchard being in bad shape.

Our Board of Supervisors has aided in every way possible the work of this Commission, providing us with spray-pumps and processing-closets for disinfecting, and instructing us at all times to do the work in a thorough manner, regardless of cost.

Respectfully submitted.

W. M. HUGHES.

MONTEREY COUNTY.

To the Honorable the State Board of Horticulture:

Gentlemen: In the Pleyto district of this county a thorough inspection of all the orchards has been made, and where the formulas of your Board for the destruction of pests have been thoroughly applied at least ninety-five per cent of the greedy scale, which infests many of the orchards in the vicinity of Metz, have been destroyed.

There is very little San José scale to contend with, and it is well under control, as is also the black scale in the vicinity of San Ardo. About 58,000 trees have been inspected in this district, and with few exceptions they were in good condition and heavily laden with fruit.

In the Pajaro district, in this county, the main fruit crop is apples, although many prunes and apricots are raised successfully. This season's apple crop is medium; apricots and prunes are a full crop of good quality. The general condition of orchards is somewhat better than last year's. We have to contend with the greedy and brown apricot scales, the woolly aphis, and red spider, with very little San José scale. Codling-moth is also bad in sections. The scales have been reduced in number by the use of winter sprays. The codling-moth is a persistent worker, and even where sprayed two or three times with Paris green it has done considerable damage. The red lady-bug is doing good work among the woolly aphis. In this district we have 366,874 trees of all kinds, distributed as follows:

Apples—	Bearing.	Non-Bearing.	Total.
Newtown Pippin	35,025	110,420	145,445
Bellefleur	32,995	69,665	102,660
Ben Davis	1,050	------	1,050
Missouri Pippin	2,665	600	3,265
Red Pearmain	11,465	200	11,665
Mixed	17,545	5,100	22,645
Baldwin	950	------	950
White Winter Pearmain	1,500	4,205	5,705
Black Twig	450	100	550
Langford Seedling	470	------	470
Winter Pearmain	500	------	500
Total apples	104,615	190,290	294,905
Apricots	22,345	204	22,549
Pears	3,485	------	3,485
Peaches	1,955	------	1,955
Prunes	41,365	------	41,365
Cherries	1,415	------	1,415
Walnuts	------	200	200
Almonds	1,000	------	1,000
Total of all fruits	176,180	190,694	366,874

Respectfully submitted.

D. W. ROHRBACK,
Secretary.

ORANGE COUNTY.

To the Honorable the State Board of Horticulture:

Gentlemen: I beg to submit the following:

Generally I think Orange County may be considered prosperous, although the demoralization of the lemon market and the exceptionally low prices for dried fruits have had a depressing effect on those industries for the present season. With oranges and walnuts it has been quite to the contrary, however.

The practice of fighting insect pests by fumigation of the orchards once each year has reduced the red scale to a minimum; and a minute yellow fly, which is present this season in great numbers, in many instances has proved as destructive to the red scale as fumigation. We therefore believe that the treatment of orchards for red scale will soon become unnecessary.

But while the above treatment has been so satisfactory as against the red scale, the same can not be said of the warfare against the black scale, which, owing to its different life history and the fact that fumigation does not devitalize the egg, has been gradually increasing for four or five years, until now the presence of this insect presents quite a serious aspect, as the cost of fumigation twice each year is almost prohibitive.

The purple scale has been found in three or four very limited areas, but energetic measures have been adopted, with the hope of exterminating it.

Beneficial insects, while not numerous, are much more so than in the past.

Foot rot and scaly bark, gum disease of the orange and gum disease of the lemon are all sufficiently prevalent to attract attention.

While the Anaheim vine disease is showing a very marked effect on the older of the replanted vineyards, it would seem that the season of usefulness of some was at an end.

The disease of the walnut has generally been less destructive this year than last, and has attracted very little attention.

Respectfully submitted.

A. D. BISHOP,
Secretary.

PLACER COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: In compliance with section four of the law relating to Boards of Horticulture, I submit the following:

Placer County has been unfortunate during the past year in the loss, by death, of our esteemed Secretary, George W. Applegate. Mr. Applegate was one of the pioneer horticulturists of our county, and in his death the county has lost one of her most progressive horticulturists and one of her most upright and honored citizens.

From January to July of the present year, we have had with us Professor Warren T. Clarke, of the Horticultural Department of the State University, who was sent to our county to make a study of fruit insect pests, and particularly of the peach-moth. The Supervisors of our county made liberal appropriations from time to time to defray his expenses and to compensate him for his services while in the discharge of his duties in our county. Professor Clarke visited all the principal fruit-growing sections of our county, and as far as it was possible for them to do so, some members of our Horticultural Board accompanied him; and we feel that his presence has been of great benefit to us and to our county. He demonstrated the fact that the peach-moth lives in the form of a worm through the winter by boring a hole under the bark of the peach trees, generally in forks of the smaller branches. There was scarcely an orchard he visited but what the live worms were found in large numbers. In some cases the worms were so small, particularly early in the winter, that they were scarcely visible without the aid of a glass. In other cases, they were nearly full grown; and as the season advanced, we found that they were larger and more lively. As the weather became warmer toward spring, in many cases we found the worms nearly full grown, and in some cases they had left their hiding places and were crawling around on the outside of the branches of the trees. This demonstrates the fact that late spraying is the only effective way of eradicating the pest, and we therefore recommend the spraying of the trees as late as it can be done without injury to the fruit.

We found by actual experiment that peach trees when in full bloom can be sprayed with the lime, sulphur, and salt solution without appreciable injury, by putting in a little less quantity of lime than the regular formula, say twenty to twenty-five pounds of lime, fifteen pounds of sulphur, and eight or ten pounds of salt to forty gallons of water; the mixture to be thoroughly boiled before using. No matter how strong the solution, it can do but little good to put it on in the winter when the worm is covered by the bark of the tree. In a few cases other kinds of sprays were used, and in all such cases the fruit was very wormy, and no appreciable results were obtained from the spraying; but when the spraying with the lime, sulphur, and salt was properly done, the fruit was comparatively free from worms; thus proving beyond all question that the only effective spray for peach trees, thus far discovered, is the lime, sulphur, and salt mixture.

In regard to pears and apples, spraying with Paris green or a preparation of arsenic has been followed, with generally satisfactory results; but the crops of all deciduous fruits have been so large that more than usual has been lost through the ravages of insect pests.

In all fruit-growing sections of the State, the crops have been unusually heavy, labor scarce, and wages high, in consequence of which large quantities of all kinds of fruit have been permitted to go to waste. As far as my observations have gone, the ground in all bearing orchards was covered with decaying fruit because of insufficient help to gather it, and also owing to the low prices received for that which had been gathered. I speak of this here to emphasize the necessity of thorough spraying next season, for the large amount of fruit rotting in the orchards everywhere will certainly be the means of producing an unusual amount of insect pests next season.

Pear-blight has thus far made but little headway in Placer County. It has been treated with the Bordeaux mixture and other recommended remedies, but with what result I am at this time unable to state.

In concluding, permit me to say that in my opinion, if the boards of trade, chambers of commerce, immigration societies, improvement associations, and the thousand and one organizations in this State trying to induce others to come here and engage in horticultural pursuits, would devote their energies to securing *quicker* and *cheaper* transportation to the Eastern markets for the products of those already engaged in the business, it would be of more benefit to the people and to the State.

Respectfully submitted.

JOHN ADAMS,
Chairman and Acting Secretary.

RIVERSIDE COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: The Horticultural Commission of the County of Riverside has the honor to submit herewith its report for the year 1902, as provided by law.

The horticultural industry of Riverside County, despite the drought and other adverse conditions, has steadily grown in the past year. The gradual decrease of the water-supply of the past has stimulated the development of water from new sources to the extent that in two years over ten thousand inches of water have been added to the irrigation ditches of the county. With the continued persistent operations of the developers of water, this county is assured of a permanent and bountiful supply, and the consequent success of its orchardists.

The increasing ratio of the importance of the industry is best shown by an examination and comparison of the valuations of the properties of the county. The total assessed valuation of all properties is $13,498,384; of acreage property, $5,173,107; of the improvements thereon, $2,016,955, of which $912,395, or nearly one half, is in the valuation of trees. The valuation of the trees is nearly equal to the value of city and town lots ($1,106,719), or of the buildings and improvements on same ($1,418,420), and is fifty per cent greater than the value of all personal property ($648,540).

The crop of the past year, in points of quantity or of quality, was not up to the splendid standard of most favorable years, but was handled most scientifically in packing and marketing. The progressive spirit of our fruit men, together with their extended experience, has resulted in one of the best cured and best packed crops that has ever been harvested in the county. The citrus crop amounted to 4,439 carloads, of which 3,948 were oranges and 491 were lemons.

The harvesting and curing of the deciduous crop have not been completed, but enough has been cured and packed to permit a very close estimate being given. After careful and extended inquiry we estimate cured fruits as follow: Of almonds, 45 tons; apricots, 590 tons; olives, 20 tons; prunes, 429 tons; peaches, 227 tons; plums, 35 tons; pears, 60 tons; raisins, 132 tons; or a total of 1,538 tons. The product in green fruits shipped will approximate an equal number of tons, including 12 tons of cherries.

The prospect for the coming year's crop of citrus fruit is for a larger yield and of better quality. About 900 acres have been planted to citrus fruits in the past year, and about 250 acres to deciduous fruits.

The county has 1,458,263 fruit trees in bearing and 365,219 non-bearing, or a total of 1,823,482, of which 1,570,959 are citrus trees.

The Horticultural Commission of Riverside County, in the inspection of orchards and in the quarantine work of the year, have employed an average of 12 inspectors for a total of 2,742 days. The three Commissioners have been employed a total of 636 days, and have accomplished the thorough inspection of 17,773 acres of orchards; they have found a very satisfactory condition regarding insect infestation, and an increasing interest among the orchardists in the eradication of the pests.

The work of eradication of insect pests, embracing the methods of fumigation, spraying, and the colonization of parasitic insects, comprised the treatment of 27,718 trees. Nearly all such work has been done under the supervision of the Commission. Fumigation was employed upon 12,659 infested trees, and 15,000 trees were sprayed with the several insecticides, principally distillate, which has finally and thoroughly demonstrated its efficacy. The parasitic insects employed include *Vedalia cardinalis*, *Rhizobius ventralis* and *toowombæ*, *Scutellista cyanea*, and a new *Proctotrupidæ*, parasitic of the San José scale, a report on which will be given later.

The utmost vigilance has prevailed in the county to prevent the introduction of injurious insects and diseased trees, plants, etc., and we have, under the quarantine laws, prevented such incursions by promptly returning consignments of stock or fruit or immediately destroying the same.

Respectfully submitted.

W. F. BUDLONG,
Secretary.

SACRAMENTO COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: We herewith submit our annual report of the fruit interests of Sacramento County for the season of 1902.

Regarding insect pests in the orchards, the brown apricot scale, which was rapidly increasing, is more quickly disappearing, since the parasite

(*Comys fusca*) has become well established. Orchards that were badly infested with scale, and tested ten per cent parasitized scale last season, are this season practically clean. We find the parasite well distributed throughout the county.

The codling and peach moths can be found where spraying has been neglected. The codling-moth was bad also in cases where the trees had been well sprayed several times. We attribute this to the spray being washed off by heavy rains.

It has been an established fact with this Board that the lime, sulphur, and salt wash would eradicate the peach-moth. In our report to the County Supervisors of February 9, 1901, we so stated.

The bean-weevil has made its appearance, the crops in some localities being quite badly affected.

Reports of trees dying after the fruit has been well set are quite numerous. In some instances four or five trees in a block will die. We have submitted samples of the roots, wood, and soil to Alexander Craw and to the State University.

The hot, dry north wind in July did extreme damage to the grape crop in some localities. In some cases the Tokay crop was from one half to a complete failure, otherwise California would have harvested her largest crop in grapes. As it was, it was an average crop.

The fruit crop has been a most abundant one with all varieties, large quantities going to waste because of poor prices and lack of help.

On all sides are heard complaints against the railroad companies on account of slow transportation and poor refrigerator service.

The growers feel that they have been unjustly treated by the canneries, which took but a limited quantity, and that of the very best grade. The growers suffered all the losses, as the canneries canned only that amount which they felt sure of marketing.

A large acreage of cling peaches was planted last spring, principally the Levi.

Respectfully submitted.

WILLIAM JOHNSTON,
GEORGE H. CUTTER,
F. M. GRIMSHAW,
Commissioners.

SAN BERNARDINO COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: In making our report to your honorable Board we have to say that we are now hard at work with our fumigating outfit, four crews being constantly employed in eradicating the black scale; but notwithstanding the amount of work to do, we are encouraged by the fact that on account of the thorough work done last year we have only about one half the pest to contend with this year that we had at that time. Other pests in this county are kept well under control. The cottony-cushion scale, although found scattered in individual cases in many of the orchards, is now so well kept under by the *Vedalia cardinalis* as to give little cause for anxiety. All necessary care is also taken against the importation of plants and nursery stock of all kinds from infested regions. And if the parasite, *Scutellista cyanea*, that has recently been imported from South Africa and is now being bred by that invaluable officer, Alexander Craw of San Francisco, for the destruction of the black scale, proves a success, the county will soon be freed of that pest also, which confines itself to the western portion.

It is generally estimated that oranges this year will not amount to more than one half to two thirds of a crop; lemons about the same. The cause of this is the dry seasons which we have had for the past five years, compelling growers to sink wells for a supply of water, without which we would have suffered much more.

The deciduous fruit industry in this county in the last three years has fallen off at least sixty per cent of what it formerly was. This is attributed mainly to the same cause.

The wine grape is produced quite extensively on hundreds of acres, with very little of the vine disease.

Conditions in the county as a whole, with the exceptions named, are satisfactory, and with a good rainfall in the coming season to increase the water supply we can look forward with confidence to good crops and a healthy state of things in all of our productions.

Respectfully submitted.

ROBERT BOSWORTH,
Chairman.

SAN DIEGO COUNTY.

To the Honorable the State Board of Horticulture:

Gentlemen: In compliance with the law governing County Boards of Horticultural Commissioners, I herewith submit our annual report for San Diego County.

Tree-planting during the past season was confined mostly to small family orchards of mixed varieties. Quite extensive preparations were made during the winter for grapevine planting, but the months of March and April were so disastrously dry that most people lost their courage, and the planting was therefore comparatively small.

Our citrus orchards as a whole are in very good condition and quite productive, although some few orchards are neglected, owing to lack of water.

The orchard pests are controlled by beneficial insects, fumigation with hydrocyanic acid gas, and in some instances on small trees by the use of sprays. Many of the worst pests are now fully controlled by beneficial insects. Such species as the *Lecanium hesperidum*, *Aspidiotus perniciosus*, and all of the species of aphids that we have here are pests of the past; as is also the *Icerya purchasi*. There are instances where the black scale (*L. oleæ*) is fully controlled by beneficial insects; several species of lady-birds feed on it. *Rhizobius ventralis* are sure to be found on trees infested with this species of scale. The little native internal parasite is found in most of our infested orchards and is often very numerous. Its work does not appear to be complete, as only a small amount of the eggs produced by the black scale is required for its subsistence.

And here I wish to speak of the new African fly, *Scutellista cyanea*. Our much esteemed State Horticultural Quarantine Officer, Alexander Craw, has provided me with colonies of this little friend, and I am very much interested in its progress and its methods of destroying the enemy. It is a much larger insect than the native internal parasite, *Tomocera californica*, and, as far as I have been able to ascertain, its work is complete. The larva requires, for its development, all of the eggs that the scale produces, and disposes of all under the scale. When pupating there remains no trace of egg shells or body of the mother scale under which they are housed. The shell is a perfectly clean apartment. I have great hopes from this little fly, and believe it to be the true internal parasite of the black scale.

On June 23d I received from Mr. Craw three colonies of *Comys fusca*, to be liberated on a tree infested with brown apricot scale. Two colonies were so liberated, the third one being placed on an orange tree infested with *L. oleæ*. On the orange tree the *Comys* have increased to great numbers. Their work, however, appears similar to that of the *Tomocera californica*. I am quite certain that the use of beneficial insects is the right way to control orchard pests.

Mites are controlled by the use of dry sulphur, applied when the plant is damp. Plants that have been infested with silver mites (*Phytoptus oleivorus*) should be treated with sulphur from year to year or until such time as you are satisfied of their absence from the orchard. The closest observer rarely ever discovers this insect until after it has accomplished its work.

Our lemon crop during the past season did not quite come up to that of 1901 in quantity, but prices ruled much higher, and the year has been a prosperous one to the producer.

The orange crop is looking well. During the early summer months we thought the dropping of oranges was so heavy that the crop would be short.

Apricots, peaches, plums, and prunes have each produced good crops, and the quality was excellent. Much of the fruit went to waste, owing to lack of labor and facilities for handling.

The Smith Mountain apple district has a large apple crop, and the fruit in quality is second to none. This locality as yet is free from orchard pests, except the red spider and a small beetle that bores in the apple, although not to exceed one per cent of the crop was infested. The red spider is generally well controlled by late spring rains.

The Julian apple crop is somewhat light, owing to damp weather during the blooming season.

The greatest increase, however, is in the grape crop. It will probably be larger this year than ever before, according to the present indications. The industry is in the best of shape.

Respectfully submitted.

F. AUSTIN,
Secretary.

SANTA BARBARA COUNTY.

To the Honorable the State Board of Horticulture:

Gentlemen: We, the members of the Santa Barbara County Board of Horticultural Commissioners, beg leave to submit our report for the year ending September 30, 1902.

The condition of the fruit industry in Santa Barbara County is very much the same as when we reported one year ago. The light rainfall last winter was not equal to the requirements of the various crops, and consequently the harvest is somewhat under the average.

The citrus orchards have done fairly well; the fumigation and spraying of last year reduced the amount of scale to a very great extent, and the trees have made a good growth, but the fruit has been less in quantity than last year.

Although fumigation seemed to be effectual at the time, we find that the Florida purple scale has reappeared this season in the trees operated upon twice last year, and has spread somewhat. The Rhizobiids, the Orci, and other beneficial insects have done much in some localities to keep the various scales in check. There will be very little fumigation in this county the present season; most of the growers relying on spraying, and the various lady-birds and flies, as the matter of expense must be considered when the price of fruit is low. Our citrus-growers are alive to the fact that their orchards must be kept in a comparatively clean condition, complete extermination of insect pests being impossible. Distillate emulsion, according to the formula of Mr. Frank Kahles, manager of the Crocker-Sperry ranch, Santa Barbara, Cal., is the spray used in this county, and when properly applied gives good results.

The walnut crop promises to be about the same as last year. The nuts are of good size, and are now ready to be harvested. A few orchards showed a slight blight, causing the nuts to wither and drop before they were ripe; but this was not extensive, and the general appearance of walnut orchards is healthy.

Deciduous fruits, of early varieties, suffered from late frosts and lack of moisture to some extent, and the quantity of late fruits will be less than in former years, although the quality will be fair.

The olive crop this year has been very heavy, and the oil produced has been abundant and of excellent quality. The trees have been well supplied with Rhizobiids (*ventralis*), and generally have been in a healthy and clean condition.

The grape crop has been fair, both in quantity and quality, with a few exceptions, where the vines show lack of vigor, and a tendency to die back, similar to the Anaheim disease.

Orchards, fruits, and nursery stocks have been carefully inspected as occasion demanded, and the State and county laws have been enforced. The fruit-growers of this county have shown a commendable disposition to coöperate with the members of the County Horticultural Board, only a few being inclined to evade the requirements for cleaning up; and no one has suggested any change to be made in the State laws.

Respectfully submitted.

C. J. RUSSELL,
JOSEPH DIMMICK,
T. N. SNOW,
Commissioners.

SANTA CLARA COUNTY.

To the Honorable the State Board of Horticulture:

Gentlemen: I have the honor to submit for your kind consideration my annual report as Entomologist of Santa Clara County.

Although my office does not really fall within the jurisdiction of your Honorable Board, it being under the County Government Act, I have adopted the same rules and regulations as are used by the regular Horticultural Commissioners.

Santa Clara County has added largely to its acreage of orchards, but on the other hand, the vineyard acreage has decreased very materially within the last two years, owing to phylloxera, drought, and other causes.

In the following table you will find a rough estimate of the acreage of horticultural products:

	Bearing.	Non-bearing.
Apples	200	50
Apricots	5,320	115
Cherries	1,290	230
Prunes	35,672	3,670
Plums	480	378
Nectarines	8	2
Peaches	4,980	3,780
Pears	1,210	180
Quinces	12	2
Olives	330	220
Citrus trees	15	12
Figs	16	5
Almonds	150	50
Walnuts	90	20
Table grapes	380	235
Wine grapes	4,500	2,000
Blackberries	242	
Raspberries	155	
Strawberries	237	

In addition to the fruit industry, this county has about 3,000 acres of seed farms, consisting mostly of onion, lettuce, and carrot seeds, with a limited quantity of flower and other seeds. Very large crops of seeds have been harvested, and there is a prospect of adding a large acreage the coming season.

During the last planting season the following trees and plants were sent into the county: Deciduous trees, 143,290; citrus trees, 205; rooted grapevines, 6,057; grape cuttings, 70,000; ornamentals, 12,687; seedlings, 82,500. Of these, 6,126 deciduous trees arrived from Salem, Or., 1,750 trees from Missouri, and 70,000 grape cuttings and 82,500 seedlings from France. All of these shipments were thoroughly inspected, and whenever necessary fumigated or entirely destroyed.

There are several insect pests troubling our orchards, and the worst of all is the peachroot-borer (*Sanninoidea opalescens*). Notwithstanding the fact that the pest is vigorously fought every season, yet it is very hard to exterminate. The best remedy used, so far, is carbon bisulphide, applied in winter when the trees are dormant and when there is no danger of rain following the application. A few years ago, through careless manipulation of this remedy, a large number of trees were killed. This has caused some growers to avoid using the carbon bisulphide, but thorough investigation has shown that damage is not necessary when the material is applied correctly. Digging out the borers by hand is largely practiced by the growers, but very often great damage is done to the tree by cutting away too much bark. As a preventive or barrier against the small, newly hatched borers, several materials have been used, especially a mixture of 50 pounds of lime, 12 pounds of whale-oil soap, and 1½ gallons of coal tar, diluted with enough water to make a thick paste, which has given very good results.

Our fruit trees are infested with several scale insects; the pear diaspis (*Diaspis pyricola*) is the most abundant at present. The olive scale (*Lecanium oleæ*) and the brown apricot scale (*Lecanium armeniacum*) are nearly subdued by their enemies, *Rhizobius ventralis* and *Comys fusca*. The use of beneficial insects as far as practicable has been my policy, and some very good and encouraging results have been obtained. During the summer Mr. Alexander Craw kindly sent me several colonies of predaceous insects, as well as several colonies of true parasites, which I hope will show some beneficial results next year.

The greatest damage which this county has sustained during the last three years is the loss of her large vineyards. The phylloxera is present in nearly every district, but this is not the cause of the great loss. Some vineyards without a trace of phylloxera have died, and again in the same vineyard only certain varieties have succumbed, while other varieties, generally shy bearers, are still vigorous, the heavy bearers generally being dead or nearly so. Scientists differ in regard to the cause of the dead vines, some claiming it to be the Anaheim disease, while others attribute it to several causes, such as heavy cropping, drought, heavy pruning, frost, etc.; but it yet remains a mystery. Many new vineyards on resistant root have been planted, preference being given to the Rupestris St. George.

Respectfully submitted.

EDW. M. EHRHORN,
Entomologist of Santa Clara County.

SANTA CRUZ COUNTY.

To the Honorable the State Board of Horticulture:

Gentlemen: The Board of Horticultural Commissioners of Santa Cruz County herewith submits its report of the work done during the past year, and showing the condition of the horticultural interests of this county at the present time.

Most of the orchards and vineyards in the principal fruit sections of the county have been inspected by the Commissioners or the local inspectors.

In some parts of the central and northern portions of the county the pernicious scale still exists in large numbers, owing to the fact that no vigorous or systematic war has been waged against it. The Commissioners have as yet been unable to cover all that territory thoroughly and to enforce the law in that regard, but expect to do so this coming winter. In the southern end of the county, where most of the large apple orchards are, this pest has, by spraying, been so reduced in numbers as to be considered practically extinct and no longer a menace to the horticultural interests there. The spray mostly used here for the eradication of the pernicious scale is the lime, sulphur, and salt wash; but owing to the large amount of work in the mixing, and some disagreeable features of its application, we find some opposition to its use, especially among small growers. Some growers have used the crude-oil spray against this pest, with good results.

The codling-moth is a very serious pest in the apple orchards, especially in the foothills, and the owners are fighting it with every known remedy, but without very gratifying success. So serious has this pest become that the general feeling among the apple-growers is that the State Board of Horticulture should aid them by securing some insect enemy of the codling-moth.

The woolly aphis has become quite serious in the valley districts, and through the efforts of Commissioner C. H. Rodgers large quantities (over 1,500,000) of lady-birds (*convergens*) have been imported for its extinction. The success of the experiment is quite encouraging.

Through the courtesy of Mr. Alexander Craw, Commissioner J. H. B. Pilkington has received several colonies of beneficial insects, including *Comys fusca*, *Rhizobius ventralis*, and *Scutellista cyanea*, and distributed them in various orchards in the vicinity of Santa Cruz.

In a very small section of Pajaro Valley considerable damage has been done to the apples by the diabrotica.

On August 20th the Board met Mr. Alexander Craw, State Entomologist, at Watsonville, and a very pleasant and profitable day was spent inspecting the various orchards and berry and onion patches in that vicinity.

The cherry crop was fair, although light in some sections; apricots full crop; prunes heavy crop; apples fair crop; grapes good crop.

Respectfully submitted.

F. W. HITCHINGS,
Secretary.

STANISLAUS COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: We, the County Horticultural Commissioners of Stanislaus County, beg to submit the following report:

We have examined every shipment of trees and vines that has come into our county, and found them to be in excellent condition, excepting a few elms, which were afflicted with leaf aphis and galls, and the trees were immediately destroyed. The varieties and number of trees were 5,000 peach, 1,000 pear, 200 apricot, 200 apple, 10,000 grapevines and cuttings, 1,000 citrus trees, 200 olive, and about 500 of other varieties.

We have succeeded in getting more orchardists to spray each year, and the people are beginning to realize and appreciate the benefits arising from the work of the County Board of Horticultural Commissioners.

Early apples and pears were completely free from the codling-moth, due to spraying in early spring; but the late fruit was almost worthless, as the spraying was not kept up late enough to kill the second brood of moth.

We find the woolly aphis is doing great damage to the roots of the apple trees, and have experimented considerably in endeavors to eradicate it, but the results have not been satisfactory enough to make public.

The San José scale seems to be decreasing very rapidly. The cottony-cushion scale is kept in subjection by the *Vedalia cardinalis*. The brown apricot scale is increasing in some localities.

There is no disease among our grapevines that we can discover, although we have given all our vineyards a thorough examination, and all indications of disease have been thoroughly investigated. We have decided to admit no vines into our county without being thoroughly gased.

W. F. WHEELER,
J. N. STUHR,
A. L. RUTHERFORD,
Commissioners.

SHASTA COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: The appointment of this Board was made so late in the season that there has been practically nothing done, but we hope to do some good work this winter.

I have seen considerable of the fruit and orchards in my own district, having handled considerable fruit. I find the codling-moth very bad in apples; to a less degree in pears. The peach-moth is also very bad. This being rather a new fruit district, it has been free from pests until the past few years; but with the importation of nursery stock and the non-use of sprays, they have had free course. Some growers have begun to fight the pests, and say that they will continue spraying; others think it does not pay, and are indifferent.

A considerable amount of nursery stock was imported into this district from Maryland before there was any Board of Horticulture in the county. These trees must be watched. There is some planting of trees each season, but nothing extensive.

The peach is the principal fruit grown, and closely following are pear, prune, apple, grape, etc. Some semi-tropical fruits are grown as an experiment. There is quite a number of orange and lemon trees in this district, which bear every year a fair crop.

The Board proposes making a thorough investigation over the county. As there is much to be done and the fruit districts are quite scattered, and as the county never before had a Board of Horticultural Commissioners, it makes the task quite a hard one.

Respectfully submitted.

GEORGE A. LAMIMAN,
Secretary.

TEHAMA COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: The Board of Horticultural Commissioners of Tehama County begs leave to submit its annual report for the year 1902.

Tehama County is just finishing up harvesting the largest and best fruit crop it has ever known. Peaches, apricots, nectarines, and plums come in comparatively free from that detestable pest, the peach-moth, and the nice fruit going into our canneries and drying-sheds serves as an object lesson to those who thought spraying was useless.

Pears and apples from the valley districts are free from the codling-moth, but we find it to be on the increase in the mountain districts. This condition is easily accounted for, as the packing-houses in the mountains are too open to fumigate successfully. We are pleased to note the fact that quite a number of orchardists have awakened to the necessity of having a tight packing-house; then we can reasonably hope to have nice fruit, as every moth may be killed by fumigation if the house is tight.

We are not troubled to any great extent with scale insects; however, the soft brown scale is here on some of our orange trees, but it is easily kept in check.

The European olive-knot that threatened to destroy the olive industry of the entire county last summer is, we believe, entirely eradicated. As there has been so much said about the impossibility of its eradication after it is once in the ground, it perhaps will not be out of place to here state the manner in which we did the work. We prepared a wagon with a large canvas spread in the bottom, on which every tree was placed as soon as it was dug up. We had a bucket near at hand, in which every little fiber root was placed; then the tree and all roots were burned. The dirt taken from the hole was spread out over the ground, so that it would be sure to dry out. So far we have seen no trace of it this year, and we believe the thorough drying is sufficient to destroy all bacterial germs.

There has been a great deal of fruit imported from Oregon, some of which was infected with moths; this was carefully watched and the infected fruit destroyed.

Fruit trees from out of the State have been carefully inspected; those which were infested with any insect or disease were condemned and disinfected or returned to the place from which they came or destroyed here.

Trees throughout the county have made a fine growth this year, which is accounted for from the fact that the fruit-grower has begun to realize that he must not expect a crop unless he gives his trees proper care and cultivation.

Respectfully submitted.

A. W. SAMSON.

TULARE COUNTY.

To the Honorable the State Board of Horticulture:

GENTLEMEN: The general condition of the county is very satisfactory as far as the work of the Horticultural Commission of this county is concerned.

Nearly all of the growers of both citrus and deciduous fruits are giving much more attention to their trees and are trying to keep them clean.

The brown apricot scale is nearly if not quite gone—cleaned out by the lime, salt, and sulphur wash and by the *Comys fusca*, introduced in this county four years ago.

The lady-bird (*Vedalia cardinalis*) is cleaning out the cottony-cushion scale. In fact, very little scale can be found in the large citrus orchards. Wherever any are found this Commission has placed a colony of this beneficial insect.

The peach and prune crops in this section were the largest ever handled.

The pear crop was almost a complete failure, caused by the pear-blight. It is the opinion of this Board that many pear trees affected with the blight will recover. Thousands of pear trees have been cleaned of the blight as fast as it appeared. These, with trees that were heavily pruned, are showing signs of recovery.

The orange and lemon crops promise to be of extra quality, but less in quantity.

The apple crop in the foothills will be fair as to quantity and of extra quality.

The quarantine regulations are carried out as far as possible.

Many large tracts of land will be planted to wine grapes this fall. The crop of wine and table grapes this year was very large and of fine quality.

Respectfully submitted.

PERRY FOWLER,
S. A. BAGGS,
C. S. RILEY,
Commissioners.

VENTURA COUNTY.

To the Honorable the State Board of Horticulture:

Gentlemen: The Ventura County Board of Horticultural Commissioners beg to report as follows:

Since our last report we have caused an inspection to be made of every citrus tree in the county. The reports of the local inspectors show that there is considerable black scale still in the county. *Rhizobius ventralis* is keeping the black and hemispherical scales pretty well cleaned out near the coast, but in some localities farther inland the lace-wing-fly larvæ are so numerous that they keep down the *Rhizobius*. We are very anxious to get the new South African parasite (*Scutellista cyanea*) introduced where the *Rhizobius* fails, in the hope that the two together will clean up the whole county.

A few trees with purple scale were found three years ago in an old seedling orchard containing about three acres. The county purchased a fumigating outfit for large trees, and a good job of fumigating was done on all the infested trees and on all others near them. For some time not a live scale could be found, and we were pleased; but after a time a few scale would be found in many trees through the orchard, so we decided to fall back on our old remedy, and had every tree in the orchard grubbed up and burned. We also found several trees on a town lot infested with red scale; these were also grubbed up and burned, so we can now report that there is no red or purple scale known to exist in Ventura County.

So little San José scale appeared on the deciduous fruits that we did not think it advisable to order a tree-to-tree inspection of these trees. Many of the poorest deciduous orchards near the coast have been grubbed up and the land planted to the more profitable lima bean.

We rely entirely on the *Vedalia cardinalis* to eradicate the cottony-cushion scale, and very few of these scales can be found in the county.

We still keep a local inspector at each shipping point to prevent the introduction of new pests. By keeping out new pests and placing parasites on those that are already established, we hope to reduce the numbers of the black and other scales until they are as little feared as the brown and cottony-cushion scales.

Respectfully submitted.

J. F. McINTYRE,
W. I. RICE,
J. B. ALVORD,
Commissioners.

TRANSACTIONS

OF THE

TWENTY-SEVENTH STATE FRUIT-GROWERS' CONVENTION,

HELD AT

SAN FRANCISCO, DECEMBER 2-5, 1902.

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TRANSACTIONS

OF THE

TWENTY-SEVENTH FRUIT-GROWERS' CONVENTION

HELD UNDER THE AUSPICES OF THE CALIFORNIA STATE BOARD OF HORTICULTURE, AT PIONEER HALL, SAN FRANCISCO, DECEMBER 2 TO 5, 1902.

Pursuant to call, a convention of fruit-growers, shippers, nurserymen, and others interested in horticultural and kindred pursuits in California, assembled in Pioneer Hall, San Francisco, at 9:30 A. M., December 2, 1902.

President Ellwood Cooper, of the State Board of Horticulture, called the convention to order and explained the objects of the meeting.

Rev. George C. Adams, of San Francisco, opened the proceedings with prayer.

Prof. E. J. Wickson, of the University of California, was chosen Vice-President.

ADDRESS OF WELCOME.

HON. EUGENE SCHMITZ, Mayor of San Francico, delivered an address of welcome, as follows:

I appreciate this sincerely as an honor and a pleasure to extend to you a cordial welcome for the citizens of San Francisco. I believe that your convention will do much toward benefiting your conditions and, as Dr. Adams has stated to you, the conditions of those who are not directly connected with you. I feel proud to stand before you to-day as a product of this Golden State, and I never felt prouder of a State than I do at the present time after coming back from a tour of the United States, and I want to say one word to you, ladies and gentlemen, of my observations in the East. I want to impress upon you that no product should be sent to our Eastern brothers and sisters labeled California fruits unless it is of the very best. I have seen all kinds of fruits and other products called Californian, and I have seen the best labeled with a foreign label; I have seen oranges that I knew came from California, and after investigation, found that they had come from California, that were labeled as coming from Florida, and walnuts that came from Spain that never saw any other State outside of the United States, and they grew, furthermore, in our own State. There should be something done to correct this abuse, and I believe that you, one and all, should work together on a co-operative plan. I want to impress upon you that there should be no jealousy toward any part of the State, because I look upon California, not as having any north, south, east, or west, but as being entirely California. And it matters not what part of the State a product comes from, each and every one of us should do what he can toward helping the State of California, and have no petty grievance against any part of it. The citizens of San Francisco, the largest city in California, are deeply interested in your work, and we hope, and we believe, that your deliberations here to-day, and during the days that you will be convened, will do much toward advancing the interests which you represent. I bid you welcome, a sincere welcome, and believe me, on behalf of the citizens of San Francisco, we will be willing and ready at all times to do our share toward benefiting the work which you are striving for. Ladies and gentlemen, welcome, and make yourselves at home. I thank you.

On motion, the thanks of the convention were extended to Mayor Schmitz by a rising vote.

PRESIDENT COOPER'S ANNUAL ADDRESS.

Ladies and Gentlemen: This is the Twenty-seventh State Fruit-Growers' Convention, and the twenty-third held under the auspices of the State Board of Horticulture.

I regret that I can not make as favorable a report on the successful marketing of the fruit and fruit products as I did one year ago. The results have not been satisfactory to the growers. Losses have been sustained by the shippers of ripe deciduous fruits and also of lemons. The olive-growers for various reasons have been sufferers financially, and it seems necessary and of vital importance that all fruit-growers should have a better understanding of their business so as to avoid the waste of money and the waste of energy. With the increased production, without an extended market, the outlook is certainly not hopeful. For seventeen years the subject of distribution has been discussed and various plans submitted, and, while the great majority of growers have favored a united plan of action, nothing definite has been determined upon toward centralizing the whole business and thereby preventing losses to the growers. A very able essay on co-operation, pointing out the differences between co-operation and trusts, was read by A. H. Naftzger at the Twenty-fifth Fruit-Growers' Convention. (See Seventh Biennial Report, pages 127–133.)

At our last convention, held in this hall one year ago, we had two papers on the distribution of fruits, one by A. H. Naftzger and one by Isidor Jacobs, and in the discussion on those papers there seemed to be a unanimity of sentiment that the plans suggested would secure the fruit-growers from losses. (See Report of Twenty-sixth Fruit-Growers' Convention, pages 24–42.)

Notwithstanding the general belief in the plans laid down, no definite course of action has resulted therefrom. Possibly we have made some progress, but still we are a long way from what eventually must come if we are to prosper in our business.

This subject involves four branches, all necessary to success:

First—The centralization of all our fruits and fruit products;

Second—Railroad time and freight charges;

Third—Adulteration and substitution of fruit products;

Fourth—Inspection laws.

The first proposition has been so often and so fully discussed that I will leave it for the present.

On the subject included in the second proposition there are two essays prepared to be read at this meeting, which no doubt will ably treat the matter.

The third proposition is a most important one, as it involves not only the financial question, but also the health of the consumers of the fraudulent substitutes. This was clearly shown a few years ago, when the San Francisco Board of Health had analyzed the jams and jellies and other fruit mixtures, and showed that all were adulterated, and that many of them did not contain any of the fruit as labeled. These bogus materials were sold on the market at lower prices than the cost of producing the pure food product, hence the depressed market for the pure, healthful foods.

In the early part of this year it was discovered that in Los Angeles three firms were coloring pickled olives, and that consumers had been poisoned by eating them. The arrest and conviction of the firms and the fine of $100 each imposed was an inadequate punishment. There is no doubt in my mind but that this news in the Associated Press dispatches throughout the country did more than a million dollars' injury to the pickled olive industry.

The selling of cotton-seed oils labeled olive oil and salad oil is a source of swindling that may drive the pure product out of the market. People are slow in being educated to a realization of all the evils attending fraudulent practices.

It was reported by a food inspector of Los Angeles that ninety per cent of the cheese on sale in that city contained formalin. A report came from Pasadena that several persons had been poisoned by eating the cheese. Almost every day records some new device in tampering with foods, so that it is high time that we inaugurate some measure to put an end to false labels. I have called your attention to the importance of this subject at every convention for many years. Adulterated and substitute foods, falsely presented, are a menace to every product of the soil and should be guarded by the same safeguards that are used to prevent the circulation of counterfeit money. If we do not arrest the practice it will eventually end in physical degeneracy and moral degradation.

The fourth proposition is inspection laws. As long ago as April, 1889, at the convention held in National City, I advocated that we should establish inspection laws. (See Report for 1889, page 329.)

I have been familiar since my earliest boyhood with the inspection laws existing in the Atlantic seaboard cities. Many of the staple articles were subjected to a careful examination before being offered for sale. Flour, if short in weight, was confiscated; if not equal in quality to the standard requirements, it was marked so that all purchasers were aware of its inferiority. Butter, if short in weight, was confiscated. Pork in barrels was subjected to the same rigid rules. No one ever contended that these ironclad inspection laws worked injury to the people; on the contrary, they were considered a necessity in order to protect consumers from fraud. We should not allow any adulterated foods to be shipped out of the State unless labeled according to law. All kinds of deception in packing should be prohibited. Unsound and damaged fruit should not be allowed to be shipped, as it has the effect of depressing prices, and causing losses to the careful growers and packers of good, sound fruit. These propositions, or the four divisions of the subject, bear directly on the question of distribution.

Insect Pests.--The State Board has made progress in the breeding and distribution of parasitic insects, and fruit-growers generally have a better knowledge of the importance of this branch of saving their fruits and fruit trees from the ravages of noxious insects. The outlook is hopeful; with proper encouragement the time is not far distant when this loss in the destruction of fruits will be very greatly reduced. We have now parasites for keeping in check all the troublesome pests excepting the codling-moth and the purple scale. The Board desires an appropriation of $10,000 to continue the search for parasitic insects. It is our opinion that we will succeed in securing the natural enemies to keep these two pests in check. We will also exhaust every effort to keep out of the State the Morelos orange maggot, and will study up this dangerous pest so as to meet it should it get into our orange orchards.

I also call your attention to the danger of grasshopper raids. Prof. C. W. Woodworth, of the State University, has written the history of his observations of this pest and its ravages in several localities this year. The College of Agriculture has had published in pamphlet form, known as Bulletin No. 142, his work. It is a very interesting bulletin, and I would especially recommend that the fruit-growers having orchards or vineyards in the vicinity of the localities raided this year read this bulletin, which no doubt can be obtained by writing to the University. It is not too late, if the conditions should be favorable for the hatching of the eggs, to prevent an increased number returning the coming spring and summer. I have suffered greater losses from the ravages of this pest probably than any other California fruit-grower. During 1871–2–3–4, I made a study of its habits. I found that in the valleys south of the Santa Ynez Mountains the hatching season commenced about the middle of April, that the insects took wing from the first to the middle of June and disappeared before the tenth of July. After the eggs are hatched, green food is necessary to their development, otherwise they would die. After they take wing they can not be controlled. Before the ovipositing season they become almost transparent. For ovipositing grounds, they seek high plateaus having a southern or southeastern exposure. They will not oviposit in loose sand, in land not well drained, nor in adobe soil. The area of oviposit grounds is limited. The ovipositing season is the time when the precautions should be taken to prevent a return. In the district above mentioned, I could with certainty go right to the spot. I marked these places, and during the winter season had them plowed deep with a mold-board plow that turned the soil well over, and then I planted a crop of barley. This ended the generation. There are causes which facilitate the continuance of these destructive pests. Among the worst is the grazing of sheep on the high plateaus. Sheep will secure their feed in the early season on the southern and southeastern sides of the higher knolls, because the grasses are sweeter, and they will keep the places practically bare, hence the sunlight will hatch the eggs. If we have bountiful rains, especially late in the spring, there is not much danger from grasshoppers, because the native grasses will be so plentiful that the sunlight can not hatch the eggs until the feed is cured. Then the insect can not live. As the boundaries of the fruit industry are extending, it is a question whether a grazing neighbor can maintain a nuisance that will jeopardize the industries of the surrounding counties.

With regard to the grasshopper plague, I have the same idea that I have with regard to all other insect plagues, *i. e.*, that the only sure method is to destroy them by their natural enemies. The apparent native home of the parasite of the grasshopper is West Australia. Albert Koebele, when traveling under the directions of the State Board of Horticulture, was sent to West Australia to obtain this parasite, did obtain it, and sent a colony to the Entomological Department at Washington, D. C. It was lost between San Francisco and Washington, through bad management. George Compere was also sent to West Australia, obtained the parasite, and sent a colony to our Quarantine Officer. The flies arrived in good order, were liberated in the Livermore Valley, but, unfortunately, a little too late; however, it is not certain but that they may still exist in the neighborhood where liberated. It is the intention of the State Board of Horticulture, if an appropriation is granted, to send again for the parasite and to make a success of the project. It must not be expected that every effort in this investigation will be crowned with success. If it were so, it would be marvelous and different from every other projected investigation.

The demands upon the Board become more and more urgent, so that we are compelled to employ a Special Agent, and not having funds sufficient, we obtained from the Southern Pacific and Santa Fé railroads passes for our Special Agent. As the passage tickets were the larger part of the expense, this enabled the Board to extend very greatly the work. I take this opportunity to thank the railroads, on the part of the fruit-growers, for their generous donation.

Cleopatra's Needle.—A brief description of this monument and the reason why it should be removed to California were given at the convention held in December, 1900. (See pages 81–82 of the Seventh Biennial Report.) At the last convention, held one year ago, a resolution was passed authorizing the State Board of Horticulture to take up the correspondence with reference to the proposed removal. The Board opened correspondence with the New York Park Commissioners, to which replies were received denying that the obelisk was scaling off, and further that a removal would not be permitted. Since this reply was received, I have seen in the New York Times that the obelisk was scaling. We have instituted an inquiry through scientific sources, but can not make any report as yet.

Irrigation.—As we have now a national law, I will not at this convention take up the subject.

Forest Protection.—The National Government has shown such a deep interest in the preservation of forests by actual work and the extension of reservations, that I will not take up this subject.

St. Louis Exposition.—The exposition to be held at St. Louis should claim our attention, as, by the postponement to 1904, our Legislature has time to consider this subject and to give aid. It should be petitioned to vote a sum adequate to maintain the position that California products are entitled to. The resolutions passed and the committee appointed to have this matter in charge could be continued so that a copy could be sent to each member of the Legislature. I also suggest that the preamble and resolutions regarding reciprocity be ratified at this meeting, and a copy sent to every member of Congress. The action of the last convention is to be found on pages 93 and 94 of that report.

Recommendations.—With these brief remarks, I will close with the following recommendations:

First—Resolutions concerning California's exhibit at St. Louis in 1904, also concerning reciprocity treaties as hereinbefore mentioned.

Second—That the next Legislature be petitioned to make an appropriation of $10,000, to be paid to the State Board of Horticulture, for the purpose of parasite investigation in foreign countries and the collection of such parasites and predaceous insects as prey upon noxious insects, and forward the same to California, to be distributed in fruit orchards.

Third—That our pure food law and amended olive oil law have the special attention of our Legislature. That some organized commission, or one to be created, be empowered and instructed to collect samples of foods and drugs on sale, have them analyzed, and the venders prosecuted and fined if said foods and drugs are not labeled according to law. That an appropriation sufficient to commence this work be placed at the disposal of said body, and that the amended olive oil Act be amended by striking out Section 9 of said amended Act.

Fourth—That there be enacted an inspection law to control the shipments of fruit and fruit products exported, by having a proper label on every package, indicating the quality or grade. That the exporting of unsound fruits or fruit products and artificially-colored olive pickles be prohibited. That oils for table use or for medicines that are adulterated, or any substitution, unless labeled according to the amended olive oil Act, be prohibited from exportation.

Fifth—That a committee of five members be appointed to present to the next convention a plan of marketing so as to centralize all the fruit industries of California under one management. That there should be embodied in this plan the employment of agents on salaries, having no other business interests except selling our fruits and fruit products.

The foregoing is respectfully submitted for your consideration.

The Committee on President Cooper's annual address was named, as follows: Capt. M. J. Daniels, of Riverside; F. M. Righter, of Campbell; Isidor Jacobs, of San Francisco; H. P. Stabler, of Yuba City; B. N. Rowley, of San Francisco.

INVITATION FROM STATE BOARD OF TRADE.

The following invitation was received from Hon. J. A. Filcher, Secretary and General Manager of the California State Board of Trade:

CALIFORNIA STATE BOARD OF TRADE,
SAN FRANCISCO, CAL., December 1, 1902.

ELLWOOD COOPER, ESQ., *President State Fruit-Growers' Convention, Pioneer Hall, City:*

MY DEAR MR. COOPER: We want to invite you, and through you the entire membership of the State Fruit-Growers' Convention, to visit the Northern California Citrus Fair, now in full blast in the grand nave of the Union Ferry Building, San Francisco, some time during the term of your session that will be most convenient to the members, either day or evening.

We would like to have you, if it can be so arranged, visit the fair in a body; but if this is not convenient let it be announced, please, that we would like to have the members visit singly or in groups whenever it will be most convenient for them to do so.

This fair presents an object lesson of interest to all Californians, and especially to those engaged in horticultural pursuits.

Trusting it will be agreeable to your body to accept this invitation, I remain, for and on behalf of the committee in charge,

Yours very truly,

J. A. FILCHER,
Secretary and General Manager.

Upon motion, the invitation was accepted for the evening of December 2d, at 8 o'clock.

THE NICARAGUA CANAL.

MR. EDWARD BERWICK. If no one has a subject to suggest, I would like to say a word on a very old subject. It is the Nicaragua Canal. It may be an old subject, but it is a good subject still. As I understand the recent reports from the morning papers to-day, there is some chance yet for the Nicaragua route to be adopted instead of the Panama route. I suppose you have all followed the course that that thing has taken. It was left in the President's hands to decide as to which route, under certain conditions, should be chosen. I was hopeful, and many of you were, I presume, that the visit of Attorney-General Knox to Paris would result in discrediting the title of the Panama Canal. That appears to be a lost hope, and the title appears to be pronounced upon as O. K., as far as one can gather at present. The next trouble that is stirring the people at Washington is the difficulty of acquiring territory in Panama for the building of the canal. The Colombian government appears to have no right to alienate soil permanently for a canal, and it has been a little disposed to put the screws on Uncle Sam to get more money from him than it is entitled to. The last news is that the Colombian minister has been withdrawn and another appointed in his place. However, I thought possible that we might again express our feelings in the matter. I think we all prefer the Nicaragua route as far as I have heard it expressed, and possibly a strong expression by our convention might have a good effect on Congress and the President. I have no resolution to offer at the present time, but we can soon arrange something of this character, that this convention of California fruit-growers is unalterably in favor of the Nicaragua route as laid out by the last Walker commission and approved by that commission until the Panama Canal was thrown upon the country, and we trust, if it be not too late, that the President might see his way to the adoption of the Nicaragua route as being the preferable route for all the Pacific Coast interests.

MR. JACOBS. In reference to this subject, I wish to say that it appears to me a matter of no note whether we favor the Nicaragua Canal or not. The action of California on this subject is very well known in Washington, but the United States government has already acted on this proposition—the money has been voted by the last Congress, the bill has been signed by the President of the United States, all of course subject to the title of the Panama Canal proving good; and, as Mr. Berwick has said, the indications are that that subject has been passed upon. There has been some little question as to certain measures undertaken by the Colombian government, but that matter has probably been cleared away since yesterday by the removal of the minister in Washington, and the substitution of a minister who, it is supposed, will place no obstacles in the way of the immediate construction of the Panama Canal, or the completion of it by the United States government. So that it appears to me that this convention to put itself on record in favor of the Nicaragua Canal, while it would do no harm, would do no good. We are all anxious to have a canal of some kind as soon as possible for the interests of the State, and it appears to me action by this convention would not be necessary, because the views of the fruit-growers of California on that subject were well aired through Congress by every means possible. California was practically unanimous for the Nicaragua Canal.

MR. BERWICK. In reply to Mr. Jacobs, I can say what I have said before. I have read in the Scriptures of a certain widow who came to a certain judge, an unjust judge, and said, "Avenge me of mine adversary," and he would not; but she came every day steadily with the same old story, and the judge feared not God nor regarded man, but that widow worried him so that he finally said: "Though I fear not God nor regard man, yet because this widow troubleth me I will avenge her." Now the California fruit-growers can not be called a widow exactly, but they can follow the widow's course and reiterate the old cry, "Give us the Nicaragua Canal." I was aware the committee was not discharged, and I have done some little work myself since we met last time in writing to the New York Arena, or rather I wrote to the Review of Reviews, and Mr. Shaw sent back my communication, saying that he had found my article very interesting, and personally he concurred very fully with me, but he thought politics, perhaps, would be better suited if nothing were said just then. I sent the same stuff to the Arena, and they published it. I then sent President Roosevelt a copy. It was referred to the Secretary of State and by him passed to Admiral Walker, who was not in Washington, but it pigeon-holed my letter. I still believe in reiterating our views for this reason: If I read the newspapers aright, there can be nothing done until a treaty is framed either with Nicaragua and Costa Rica or the Colombian government. That treaty must be received or rejected by the Senate. We might be in time to modify the Senate's action, and I don't think it is altogether futile to persevere in our past action and try to get the thing done as we want it. We were told years ago that it would never be done in any way or shape. We have moved one step forward and the money has been voted for a canal; but I think it is not decided yet definitely and certainly, and I think our action at least can hurt nobody, and the fruit-growers of California are entitled to some voice in a matter in which they have so paramount an interest.

CAPT. DANIELS. We certainly are always glad to have brother Berwick with us at these conventions, even if he has the Nicaragua Canal in his pocket. He quotes scripture about a widow. It seems to me I remember something in the Scriptures, or some place, about a maiden lady who went out and prayed in the dark by herself, "Good Lord, send me a husband." And an owl said, "Whoo-whoo-whoo?" And she said, "Any one, so it's a man." Now, give us a canal; we care not whether Nicaragua or Panama. What we want is a canal, good Lord! So let us petition Congress to give us a canal.

MR. BERWICK. It is not any old canal we want, but the Nicaragua Canal.

CONSULAR REPORTS.

MR. BERWICK. I will suggest one more subject: I would like to say a few words regarding another subject important to the fruit-growers. We none of us know too much. We are all trying to learn, and there is one thing of special interest to us, and that is the value of our products, the price we can get. Now the way to know the value of your product is to hear regarding that product in the world's markets, what the crops in distant countries are and the prices and stocks; and after a good deal of work we got the thing arranged so that the consular service should report from their various points what prices and stocks and crops were likely to be, and it helped us a good deal. It helped us this year that there was no crop of prunes in France. We ought to know those things as soon as possible. At the last convention, Mr. Goodwin, of the Commercial Museum, was here, and told us of the work done. He asked for a small contribution toward the funds of the museum. It was then said, I believe, that we thought the State Board of Horticulture should carry on that work through its Secretary, and Mr. Goodwin was rather discouraged. Now I should like to know what the State Board has done regarding that $50 request, if we can make him that present or not, and whether we want those advices continued.

MR. STEPHENS. I will state that during the last year our expenses have been such as to really prohibit making that appropriation. However, it is possible next year we might do something in that way. If we knew at the present time how much the convention is going to cost us, we could probably do something now.

MR. JACOBS. We have with us a Congressman elected from the southern part of the State, and it appears to me that as he has taken part in these deliberations for some years with us, the convention could appoint him a committee to investigate the subject and see if the consular reports can not be sent direct to the State Board of Horticulture; and as they are all filed in Washington for the information of the people of the United States, if the proper effort were made we would get them, and we could then distribute them through the various counties.

PRESIDENT COOPER. This question will be postponed until Mr. Goodwin is present. The motion now before the convention is the resolution of Mr. Jacobs, that Mr. Daniels be appointed a committee of one.

Motion carried.

On motion of Mr. Berwick, Mr. Goodwin was requested to appear before the convention and give information regarding consular advices, he to be invited by the Chair.

IMPROVEMENT OF THE ORANGE.

By PROF. J. W. MILLS, of Ontario.

The Washington Navel has justly been named the King of Oranges. A cluster of ripe and well-grown oranges of this variety is indeed a beautiful thing. When used for decorative or other purposes, it is difficult to surpass it.

The Washington Navel has won for itself a reputation in the markets of the country that will undoubtedly be maintained. Taking this view of the case, we will confine our remarks to the improvement of this variety, and trust that any suggestions that may prove a safe guide for this kind may also prove to be a safe guide for the improvement of other varieties.

Whenever we start out to improve anything, we should have an ideal as our goal, and work up to that. What, then, would we consider an ideal orange? Beginning with the ordinary Washington Navel, we have a seedless sort with room for much improvement. A noted grower and propagator has endeavored to unite, mechanically, those qualities of the orange which will give high flavor and color, thin skin, seedlessness and productiveness. These, then, we will consider the qualities of a high-grade orange.

Nature's ways of producing all new varieties and improvement of its species in the orange are by seedlings and bud variation. The fact that the Washington Navel orange is, with few exceptions, seedless, reduces its chances for variation and improvement to one natural process—bud variation. There are now two new types of the Washington Navel being introduced, that originated in this way. One is the Golden Nugget Navel that first came to light in the J. P. Englehardt orchard at Glendora, Los Angeles County. It is very thin-skinned and is much earlier than the ordinary Washington Navel. It is not a seedling, and there is not another bearing tree like it in existence at this time that has not been propagated from it. Golden Buckeye is another type of Navel orange that has a thinner skin than the above, has a very light color, and all pack as "fancies." It came as a "sport" in a twenty-acre grove at San Dimas and has a history similar to the Golden Nugget.

Mr. A. C. Thomson, of Duarte, has an orange, the history of which he gives as follows: Buds from a good Blood orange and buds from a good Washington Navel were split and grown together and produced a tree. The same process was followed with St. Michaels and Washington Navel, and with these two new crosses, as he calls them, he repeated the operation, thus uniting the qualities of the St. Michaels, Blood, and Navel oranges. This variety has been tried longer than the two sports mentioned above, and in frostless locations have ardent advocates, while other growers similarly located do not consider it as good as a choice Navel orange. In locations subject to severe frost, say 25°, it is not desirable, because it is very tender and much injured by that temperature. It is a very fine looking orange, but seems to lack flavor.

What the other two oranges described above will prove to us, remains to be seen. If they will retain the good qualities they promise us, under all conditions, they will be marvels to be sure. If they prove to be as excellent under trying conditions as some Washington Navel oranges of the original strain have proven to be, they will be—what? This brings us up against the proposition that some of the original Washington Navel oranges are as good as any in certain places and under certain conditions. If this is a fact, it will be interesting to know those conditions.

We know that Navel oranges of the same stock, planted on different soils, will produce different grades of fruit. The same strain of trees planted on the same kind of soil will produce different grades of fruit under different treatment. We have seen a common strain of Washington Navel orange, grown on light gravelly soil in a frostless location and fertilized in a certain way, produce fruit that was lighter in color, twenty-five per cent heavier, and earlier than the same kind of orange grown four miles away on richer land, with no attention but irrigation and cultivation having been given to the grove. A thin-skinned orange grown in a cold location will immediately put on a thicker rind than when grown in a frostless location. Certain fertilizers will produce a thick skin on an orange which before had a thin skin. Here, then, is a hint that the oranges which we already have growing are capable of improvement.

Of all cultivated trees, the orange is perhaps the most ravenous feeder. It sends its millions of fibrous roots searching through the soil, seeking what they may devour. No tree affords a better chance with which to demonstrate the effects of fertilizers. The growers of Southern California realize this in conjunction with miserable failures in experiments in fertilizing, and some of them have united and employed a man to experiment along this line. The principles of fertilization which underlie the proposed plan of the experiments are aimed at the improvement of the orange, and a short explanation of these principles may be of interest to you at this time.

It is known that certain elements have certain offices in plant growth and the production of seed. For instance, phosphoric acid is always found to be more abundant in the seeds of certain plants than in any other part, showing that this element is active in the production of seeds. When the production of seed is desired, which means fruit, it is important to have the phosphoric acid where the plant can have it to draw upon at the proper time. This is a problem to determine in orange culture. It is supposed that if it is applied in the fall, the tree will have taken it into its system in sufficient time to put it into the fruit wood at the time when the buds are being formed. So much for this element.

It is well known that nitrogen produces growth of wood and bloom. Nitrogen must be in the form of nitrate, in order to be available as plant food. The soil may contain an abundance of nitrogen, which is entirely unavailable as plant food until it is converted into the nitrate form. The organisms in the soil which cause this change work most rapidly in a high temperature. Consequently, if the weather continues cold at the time when the trees are putting out their bloom, and if the proper form of nitrogen does not exist within reach of the roots, the blooms become impoverished, and as a result a heavy dropping of the young fruit can be expected. In such a case an application of nitrate of soda, or some other immediately available form of nitrogen, will relieve the tree and a normal circulation of the sap will ensue, giving strength and vigor to the young fruit.

Thus far we have dealt with getting the fruit on the tree. During some seasons when there is an abundant crop of oranges, splitting early in the season and puffing late in the season are common occurrences. All such fruit is worthless for the market. Here is a chance for an improvement. There exists some definite cause for these troubles, and there is surely some remedy. What it is has not been determined, but it is evidently due to the improper development of the fruit.

It is known that potash retards growth and hardens vegetable tissue, and, by way of experiment, it is proposed to apply potash at a time when the fruit is not fully grown to get this effect. There was an instance in a Florida grove whose fruit had always been noted for its poor keeping qualities. Potash was applied, with the result that this grove turned out fruit that had as good keeping qualities as any that was shipped from the State.

The above principles are given as a working basis for the improvement of the orange, and must not be taken as a cut-and-dried rule to work by. The contents of the soil vary, so that many experiments must be made before an intelligent application of the principles can be made.

ADDRESS BY PROFESSOR BENJAMIN IDE WHEELER.

Members of the Fruit-Growers' Convention: I took so much of your time last year, that I shall not take much of any this, but I can express to you my cordial feeling of desire to co-operate in what you are doing. I want you to feel that the University, in every part of it, has a profound interest in the development of those things which interest you. We have, during the last few months, been carefully considering the development of a Department of Horticulture distinct from other departments—a department which shall be co-operative with, and subsidiary to, the Department of Agriculture, but which shall be distinct in the same sense that the Department of Botany has been differentiated out of the Department of Agriculture, and created a distinct department. It seems to me that there would be many advantages in this, as we should have a distinct body of workers with a distinct equipment, who could affiliate themselves with such work as you and the State Board of Horticulture are undertaking. There would be a handle sticking out of the University which you could take hold of, not that there would be necessarily many more men employed at first than now are, or that there would be from the internal side of the University, at first, a radical change in conditions, but from the outside there would be, as I say, a handle sticking out which could be definitely taken hold of, and it is always convenient to know where to take hold of anything; a great many people don't take hold at all, because there are no apparent handles.

The other thing I want to tell you is, I wish you would come over and see us. The miners came over, and I know that most of them were surprised to find out that the University of California had grown into what it now is. I know that Californians generally do not know of their University as well as people who live outside of California. They are not aware that its standing in the general scheme of things is so high. I think I have a right to ask you, then, to acquaint yourselves better with what is being done at Berkeley. The University of California is rated in "Minerva," the yearbook of the universities of the world, as the fourteenth university in the world, and as the third in the United States. And here, within these few years, the pioneers of California and the fruit-growers of California have built up an institution which ranks with the great institutions that the old cultures and old civilizations have built up. I suppose it is true that we have got to expect that the greatest things in culture will always be found where the rains do not descend with any degree of regularity. It is apparently the mission of those people who live in deserts and the arid regions to lead the world, because they have got to plan and have to co-operate in order to adjust to their needs the supplies of water which may be found. It is always best for people to have to put their thinking caps on—the best and greatest people are those who have to put them on. The man who has to bring water through ditches onto his land has to plan, and has to stretch out his hands to his neighbor. It is through organizations of this sort that the co-operative organizations of men are inaugurated. If two men locked together are ten times as powerful as one man, when you get up to three men, I don't know what the multiple is. Therefore, I am glad to meet you fruit-growers of California, because you stand for what you do, but most of all because you stand for joining hands and for co-operating in the work you have to do, and I want you to feel that this presence of mine here means nothing more nor less than that the University of California wants its hands joined with the hands of all those who are willing to do something to move and to make things go.

Upon motion of E. M. Ehrhorn, the invitation of President Wheeler to visit the State University was accepted, the time of the visit to be announced later.

MR. JACOBS. I would like to ask President Wheeler, in regard to the question of adulterated foods and olive oil, whether the chemical department of the University would undertake the examination of adulterated foods.

PRESIDENT WHEELER. Means should be provided whereby that can be done as a separate and new undertaking. It should not be thrown upon the University with its present resources, but it can easily be provided for, and indeed two years ago would have been provided for if it had been absolutely necessary under the bill which was proposed. If that bill had finally been carried through, we had planned to find in some way the means to provide for the investigation—no, I am thinking of another question, fertilizers. But in this case we are undoubtedly in a position to see to having it done in the best possible way, and would be entirely ready to undertake it, only, of course, provision should be made in the bill which is passed for the expense of doing it.

MR. RIGHTER. Do you attempt, in case of a new pest, to determine what it is and try to hold it in check and destroy it?

PRESIDENT WHEELER. We have done so. For instance, we have the peach moth as an illustration. We combined with the people of the region where the trouble was—the Auburn region—and sent Mr. Clarke there. They provided for his expenses while there, and we provided him, and the thing was taken care of very definitely, as you probably know. As far as the University of California has any money left anywhere, in the corner of a bureau drawer, or on an upper shelf, we scrape it all together and use it for things of that sort; but the general answer to your question is, "Yes."

On motion of Mr. Righter, a rising vote of thanks was extended by the convention to President Wheeler.

At this time a recess was taken until 1:30 o'clock this afternoon.

AFTERNOON SESSION—FIRST DAY.

TUESDAY, December 2, 1902.

The convention was called to order at 2 o'clock.

President Cooper announced the following committees:

On Resolutions—B. N. Rowley, E. M. Ehrhorn, J. F. McIntyre, A. N. Judd, R. D. Stephens.

On Legislation—Captain M. J. Daniels, William Johnston, H. P. Stabler, Colonel H. Weinstock, Alexander Gordon.

On Transportation—R. D. Stephens, Alden Anderson, A. H. Naftzger, A. N. Judd, Alexander Gordon.

On Nicaragua Canal—Edward Berwick, E. F. Adams, B. N. Rowley.

MR. BERWICK. The Committee on Nicaragua Canal was instructed to prepare a resolution concerning that canal or the Panama Canal, and the committee has agreed upon the following:

Resolved, That this annual convention of California fruit-growers, assembled this second day of December, 1902, in San Francisco, hereby records its satisfaction at the appropriation, by Congress, of the funds needful for the construction of an isthmian

canal. But while we recognize that the construction of a canal at Panama will add greatly to the commercial facilities of the world at large, in which the people of this country will participate, we declare that it will be no such advantage to those who will pay for its construction and contribute three fourths of its business as a canal constructed by the Nicaragua route as last surveyed by the Isthmian Canal Commission. We therefore submit that so important an enterprise ought certainly to be so carried out that the people who bear the cost should also be the principal beneficiaries, and we look to the Senate to take care that the isthmian canal shall even yet be built by the Nicaragua and not by the Panama route.

Referred to the Committee on Resolutions.

THE APPLE INDUSTRY OF CALIFORNIA.

By C. H. RODGERS,
President Pajaro Valley Orchardists' Association.

From the high Sierras across the hot, dry interior valleys to the sea, in every county of our State, we find the apple growing and maturing its fruit.

Though of all the fruits, adapting itself to the widest range of latitude and conditions, it attains its highest degree of perfection only under certain surroundings.

This fruit delights in a deep, rich soil and a cool climate. These conditions are absolutely necessary for success in raising the most profitable kinds—the winter varieties. Such combinations of soil and climate are found mainly in the coast counties and in the mountains of our State.

The climate of a belt of the whole western slope of the Sierras is well adapted to the growth of the apple, particularly the varieties Baldwin, Spitzenberg, Hoover, Ben Davis, Winesap, and Greening. This belt varies somewhat according to latitude. On the north it might be given in general as ranging between 1,500 and 3,500 feet above sea-level, and gradually increasing in altitude southward until the limit is between 2,000 and 4,000 feet, while in the mountains of the extreme southern part of the State the best apples are produced at an elevation of between 4,000 and 5,000 feet. The favorite varieties in the last named section are the Duchess, Jonathan, Greening, and Bellefleur.

In the coast counties some of the finest apple orchards are located within a short distance of the ocean and at an elevation of but a few feet, and while along the coast choicest red varieties, Spitzenberg, Jonathan, and others, may be raised as high as 3,500 feet, on account of climatic variations the limit at which any variety can be depended upon to yield a full yearly crop is about 2,000 feet above the sea; and yellow varieties, as Newtown Pippin, Bellefleur, and White Winter Pearmain, are not profitably grown above an elevation of 300 to 500 feet, because of the prevalence of apple scab and other fungi.

The history of the apple in California began with the founding of the missions. The few that were planted were seedlings, and proved of such inferior quality that this fruit was not propagated to any extent. The "rancheros" gave but slight attention to the planting of apples or, in fact, to any other fruit, although one of the stipulations under which a land grant was obtained required that fruit trees should be planted.

It was not until after the settlement of the State by Americans that the apple received its just consideration.

In the early fifties small plantings of this fruit were made in widely scattered localities of the State. As the plantings were mainly experimental, it was the rule to set out many varieties. The result was that in a few years it was demonstrated which localities were best adapted to this fruit, and also the varieties most suitable to the peculiarities of the different districts.

It soon became apparent that the extensive planting of early or summer varieties would not prove profitable, as they ripened at a time when other fruits were plentiful.

The climate of the hot interior valleys did not prove conducive to best results with the late winter apples. For these reasons the planting of commercial orchards was confined mainly to a few of the more favored localities where late varieties flourished best. Some of the bay counties proved well fitted, in both soil and climate, to the requirements of the favored varieties, and in these counties the industry mainly centered.

Santa Clara County led in acreage and production. The magnitude to which the industry had attained in this county may be imagined when, at one period during the late seventies, the assessor's returns showed over 1,000,000 trees.

Prices ruled high in those days. From $2 to $4 per box was not out of the ordinary for choice apples late in winter. The industry continued to be the source of great profit until the appearance, almost simultaneously, of two of the worst pests that the apple-grower has had to contend with—the codling-moth and pernicious (commonly called San José) scale. The first named appeared in our State in 1874, and the latter in 1873.

Partly through apathy on the part of the grower and partly through ignorance of the best methods of combating these pests, such havoc was created that by 1880 the industry was practically abandoned in what had been the foremost districts in the State.

Stimulated by the demand and high prices consequent upon the curtailed output, other apple sections whose climatic conditions were not so favorable to the increase of these pests rapidly came to the front in increase and output.

Santa Cruz County took the lead and still is the leading apple-producing county, with 688,000 trees. Monterey County is second in acreage, with 380,000 trees. While in both these counties only about one third of the trees have reached full bearing, their combined yield last season amounted to 1,700,000 boxes.

Sonoma County ranks second in production, but not in shipment of apples. No definite figures could be secured, but an approximate estimate places the yield of this county at 750,000 boxes, only 100,000 of which are shipped green. The balance is dried, and the estimate places the dried product at upward of 1,800 tons. The apples principally raised in Sonoma are Gravenstein, Baldwin, Spitzenberg, and Newtown Pippin.

The other prominent apple-shipping counties are Humboldt, with an approximate crop of 150,000 boxes; Santa Barbara, yielding 50,000 boxes; San Diego, yielding 25,000 boxes. The product of other sections finds sale mainly in nearby markets.

Markets for export apples are found in other States of our Union, in Mexico, in several of the European countries, in Australia, and, to a slight degree, in the countries of eastern Asia.

With liberal treaties and trade relations which would confer reciprocal advantages, a promising field for the sale of our apples and other fruits could readily be developed in the Orient, particularly in China. This would apply especially to the smaller sizes of the various fruits which are so difficult to dispose of in our present markets.

Apples of the Pacific Coast are marketed in pine boxes measuring 10 x 11 x 22 inches, and when filled weigh about fifty pounds. For export each apple is neatly wrapped in paper.

The grade is determined according to the number of rows or tiers required to fill the end of a box. The grades are known as 3, 3½, 4, 4½, and 5-tier. The 4-tier is in greatest demand for export trade, and prices are generally quoted on a 4-tier basis. The size of this grade ranges from 2½ to 2¾ inches in diameter. There is but limited demand for extra large sizes, and prices of the 4½ and 5-tier rule low.

As with all other branches of the fruit business in the State, this industry is confronted by a most serious problem—that of labor. Every encouragement has been held out to Eastern labor by the fruit-growers of the State, aided by the railroad companies, but without success. Thousands of tons of choicest fruit have rotted on the ground during the last few years, owing to scarcity of laborers. This being the case, how lamentable is the outlook for the future!

The ratio of increase of fruit production will in the immediate future far outstrip the ratio of any possible increase of white labor. With these facts before us, what recourse have we in our dilemma? As in other emergencies, we are forced to shift our position and face about to meet unforeseen conditions. This axiom is markedly exemplified in the present attitude of the fruit-growers of this State on the question of

Chinese immigration. It is the sentiment of a large majority of the fruit-growers of the State that our shortage of white labor can best be supplemented by Chinese. While our fruit-growers would assuredly oppose the unrestricted immigration of Chinese or other alien labor, still they feel that, without doing injustice to the interests of American labor, a limited number of this class of laborers should be admitted from time to time according to the needs of the State. Such innovation upon our present exclusion laws would, of course, have to be surrounded with the most rigid regulations.

Failing this relief, shall we not in the future be compelled, as we have recently, to witness the degrading spectacle of our wives, mothers, and daughters being forced to engage in labor that every right-minded American feels should be done by the male sex only!

The leading apple district of the State is Pajaro Valley, two thirds of which is located in Santa Cruz County and the balance in Monterey County. Its chief shipping point is Watsonville, located on the line of the Southern Pacific Railroad. As this valley produces for export far more apples than all other districts in the State combined, or fully ninety per cent of outside shipments, a short description of it might be of interest.

Opening out upon the ocean, insuring coolness of climate, an annual rainfall averaging twenty inches, together with the water table ranging from ten to twenty feet from the surface, insuring sufficient soil moisture, a soil of great depth and unusual fertility, Nature has by this unparalleled combination of favorable conditions specially fitted this valley for the highest development of the apple.

The importance of the industry in Pajaro Valley can be realized when it is stated that it and its tributary cañons contain 862,000 apple trees, and produced last year 1,500,000 boxes, the returns from which brought over $1,000,000 into the town of Watsonville. It must not be inferred that all this amount was shipped in the green state. Large quantities of the inferior grades were converted into the dried product and into cider, vinegar, jellies, jams, etc.

The dried product alone this season will amount to about 900,000 pounds. As but one third of the trees are in full bearing, with the present rate of increase this valley, within the next decade, will produce 5,000,000 boxes annually.

While in the Pajaro Valley the widest range of varieties of best quality are produced, among which are Early Harvest, June, Astrachan, Gravenstein, Fall Pippin, Skinner's Seedling, Rambo, Jonathan, Langford Seedling, Winesap, Lawver, Missouri Pippin, Smith Cider, Red Pearmain, White Winter Pearmain, and many others, the principal kinds grown, and the only varieties that are being planted at present for commercial purposes, are the Newtown Pippin and Bellefleur. The great demand for these two varieties is due to their superiority, and also because they can be profitably grown only in a few limited sections of the world.

Of the 862,000 apple trees in the valley, approximately 400,000 are Newtown Pippins and 250,000 are Bellefleurs.

The red varieties are neglected, because of their coming into direct competition with Eastern apples.

The best grades of apples, after being packed, are mainly bought by outside dealers for Eastern and European markets at prices ranging from 75 cents to $1.10 per four-tier box, f. o. b. cars at Watsonville. The inferior grades are placed on the markets of this State or are converted into the by-products already enumerated.

The apple in this district is remarkably free from disease, and failure of crop is unknown.

The crop heretofore has been handled mainly by dealers who pay the orchardists a "lump" sum, ranging from $100 to $200 per acre, for the fruit on the tree; but as the orchardists have become convinced that this method of selling is working an injury to the industry, the present tendency on the part of the growers is to pack their own fruit or to have it packed by reliable firms.

The apple business, along with other branches of the fruit industry of our State, suffers hardship through excessive freight charges. Our railroads exact for one week's haul more than the orchardist receives for the same amount of fruit, and which it requires a whole year to produce. However, in justice to the railroad authorities, it should be said that they now realize the moderation of our demand for lower freight rates, and, as a beginning, have recently reduced the rate on apples from Watsonville to Mississippi River points from $1.05½ to 85c per 100 pounds, a favor which our apple growers and shippers appreciate and are truly thankful for. While no concessions have been made on rates to extreme Eastern points, we believe a reduction will be granted in the near future. The present rates are excessive at $1.05½ per hundred pounds to points east of Chicago, and at $1.35 to some points in Arizona and New Mexico.

As to insect pests, the codling-moth here, as in all apple-growing sections, is the cause of the greatest loss to the orchardist. The woolly aphis ranks second in damage wrought. Of the two leading varieties of trees grown, it attacks and causes greatest damage to the roots of the Newtown Pippin, and to the limbs of the Bellefleur. A number of beneficial insects aid in keeping this pest in check, but their natural increase is not sufficient to control it. Ladybirds lead the list and the varieties *Hippodamia convergens* and *Hippodamia ambigua* feed on the woolly aphis almost exclusively during the summer months. As these ladybirds are found in great numbers in some parts of the State, and are easily procured, the Pajaro Valley Orchardists' Association this season, upon recommendation of the Horticultural Commissioners, brought in and distributed through the orchards upward of 1,250,000 of these insects. They performed the work in an entirely satisfactory manner.

Nurserymen have been slow to adopt the plan of propagating trees on roots resistant to the woolly aphis, but such stock is now being offered at our local nurseries.

Pernicious, or San José, scale, although never a serious pest in Pajaro, through vigorous action on the part of the Horticultural Commissioners has been practically exterminated.

The codling-moth has baffled all efforts to keep it under control. Orchardists, after being imposed upon repeatedly by dishonest manufacturers and wholesale dealers in Paris green, have become suspicious of all brands of Paris green on the market, and have shown a lukewarmness in its further use.

Last year, exasperated by the continued fraudulent impositions practiced upon them, the Orchardists' Association of Pajaro Valley filed a complaint with the State Board of Horticulture against two of the leading wholesale druggists of San Francisco, charging them with selling unlawful Paris green. The State Board of Horticulture, in pursuance of the law, filed complaint with the Attorney-General. This official, whose duty it is to prosecute such cases, relegated the complaint to some musty niche in his office, or, perchance, to the waste-basket.

The loss through the codling-moth has been to such an extent this season that the Orchardists' Association has appealed to the Agricultural Department of the University of California for expert investigation, and as a result of this request the University authorities have kindly consented to detail a specialist next season for the purpose of determining the best methods of combating the pest in this particular locality.

In conclusion, while definite figures could not be obtained, an approximate estimate, based upon the data collected, gives the State 2,500,000 apple trees, yielding 3,250,000 boxes, about sixty per cent of which is marketed green; thirty per cent is dried, and this product amounts to 5,000,000 pounds. The remaining ten per cent is converted into cider, vinegar, jellies, jams, etc.

Though little is said or written about the apple industry of this State, and although it is not of equal magnitude with some branches of the fruit industry, yet it is not of least importance, and it swells the grand total of California's fruit returns to the extent of upward of two millions of dollars annually.

FRUIT TREES THAT SHOULD BE ROOTED OUT.

(From Personal Experience.)

BY JOHN MARKLEY, OF GEYSERVILLE.

Some fourteen years ago I planted an orchard in Sonoma County, adding from year to year until I had one hundred and ten acres in trees.

Prior to that time, I had had experience in grafting, budding, and planting trees, both in the East and in California. After investigating the soil conditions and existing orchards in that section of the country, I planted principally prunes, peaches, pears, and cherries, they being the principal fruits grown in that section as staples; and also planted English walnuts, almonds, apricots, olives, Tragedy prunes, etc., by way of experiments.

My orchard was well cultivated and cared for. When the first part of the orchard was about nine years old, I went systematically all over the orchard with my foreman, inspecting each block of trees. We discussed the following questions: Does this block of trees pay? If not, can we do anything to them or for them to make them pay? If not, what had we best do with the trees and the ground?

The result was finding more trees, after this investigation, than either of us had anticipated, that we both condemned as unprofitable. The next proposition was what to do with these trees. Some were rooted out, and some were cut off and grafted to other varieties; but if I had it to do over again, I would root them all out, put the land in extra fine condition, buy *first class* young trees, of the variety I wanted, and graft them, because I find that a grafted-over tree, as a rule, never makes as good a tree as a standard tree planted in place. If single trees were condemned, the rule was to work them over to the variety planted around them, because it is very hard to make a young tree grow in an orchard of old trees.

Another reason why I would root trees out instead of grafting them over, is that some trees will take a good graft and make a good union, but when they come into bearing will die. As an illustration of this, I will mention three Tragedy prune orchards grafted over, one to French prunes, one to Robe de Sargent prunes, and one to Silver prunes. With all of these trees the unions were good, the growth strong, and the trees appeared to have plenty of life and vigor, but when they came to bearing, they died very fast, and now I think about all, save some of the Silver prune grafts, are dead.

All of my life I have been a close observer and great lover of trees. I take great pleasure in orchards and forests, so much so that I have ridden thirty miles in California to see a tree of note, and when I am near an orchard or forest I spend much time therein. I have spent hours walking in the grounds of the late General Bidwell at Chico, looking at the many beautiful and interesting trees from many parts of the world.

For eight years of my life my occupation has been such that much of my time was spent in traveling over California, having visited every county in the State but two—some of the counties many times. Having visited and inspected many of the orchards of the State, it is my opinion that if each owner would carefully go over his orchard, and apply the same test that I did to mine, he would be compelled to condemn many blocks of trees, and a very great many single trees, and if these trees were rooted out, it would remove from the market a very large part of the inferior, often worthless, fruit, much to the advantage of grower, packer, and consumer.

THE CALIFORNIA FRUIT-GROWER, AND THE LABOR SUPPLY.

BY HON. H. P. STABLER, OF YUBA CITY.

Labor is the problem of the twentieth century. To-day a Presidential commission is striving to arbitrate the differences between 147,000 workingmen and the owners of the Eastern coal-fields. A careful study of the proceedings of the inquiry, as promulgated by the daily papers, the weekly journals, and the monthly reviews, will be of interest to the California fruit-grower. Labor is the greatest factor of expense in any industrial enterprise, and this is particularly true of the fruit business of California. In order to successfully operate the orchards and vineyards there must be at hand an adequate supply of efficient labor. During the past four years this supply of help has not always been adequate nor has it always been efficient. The unprecedented scarcity of orchard help during the past season has been noted in every fruit district of the State. Even an advance of twenty-five and fifty per cent, and in some instances one hundred per cent, in the price of labor has not been sufficient to secure the necessary help to harvest the crops. Tons upon tons of fruit have been lost to the producers from this cause. Nor has the orchardist alone been the sufferer; grain and hay farmers have felt the need of help. Hop-growers have found it necessary to advertise liberally for pickers, and have held out unusual inducements in the way of wages, camping facilities, etc. Dairymen have in some instances been under the necessity of turning their cows into pasture for want of milkers. Kitchen help is almost beyond the reach of the average grower, and it is not unusual for the cook to be the best paid man on the ranch. Increased acreage and increasing tonnage are largely responsible for the short supply of men. New fruit districts are annually coming into bearing. Canning establishments are increasing their output, while dried-fruit packers are annually developing and extending their plants.

Further illustrations of the conditions that confront us would be useless. Suffice it to say that we fruit-growers of California realize that measures to relieve the present scarcity of labor must be taken before the approach of another crop. "The harvest truly is great, but the laborers are few." An essay on the labor supply is necessarily not an exhaustive treatise. Your patience and my ability will not permit an historical review of the question from the beginning of the fruit industry of the State. Nor is this necessary for our present purpose. You are practical men. You have a problem to solve, and it is my purpose to offer a solution, if possible.

In passing I will state, then, when the growing of fruits, both deciduous and citrus, began to occupy the attention of Californians, there were present among us many Chinese. Orchardists freely availed themselves of the services of the Chinaman until the operation of the exclusion law prevented his immigration into the United States. Emigration, death, and other causes, have so reduced his numbers that he is hardly a factor in the labor problem of the fruit-grower. By boarding and lodging himself, the Chinaman relieved the grower of the responsibility of maintaining a boarding-house on his premises, and many growers advocated his employment. Whether or not Chinese exclusion has been a benefit to the horticultural interests of California is a mooted question among fruit-growers. However, we must meet conditions as they exist, and in casting about for an increased supply of labor for next season the Chinaman is not to be considered.

After the advent of the Chinese our shores were invaded by hordes of "little brown men." The Japanese were advocated by many as satisfactory laborers for orchards. The Jap also boarded and lodged himself and his employment was considered a convenience by fruit and grape growers. But while the Chinaman had many faults, and was never an ideal workman, the Jap was worse. Surely if Bret Harte had known the Jap in pioneer days, as he knew the Chinaman, he would have found the "little brown man" much more "peculiar" in the matter of "vain tricks" and "dark ways." But why go on? You knew the Chinaman. You know the Jap. There undoubtedly were many reliable, efficient Chinamen, employed in orchards and vineyards; possibly there are some honest, faithful, industrious Japs, who will not break their contracts in the height of the fruit season, and leave you with your product rotting on the ground, who will work for your interests and not loaf on the job, who will not "lay off" when work is rushing, and demand that employment be provided when there is a cessation of activities for a day or two. I say there may be some Japs of the character and description indicated. If there are any I would be obliged if the information might be cabled to me collect, since it has never been my good fortune to see or hear of any Japs of that class.

However, the Japanese are here in goodly numbers, while more are coming, thus allowing growers who appreciate that labor to secure a supply for the coming season. Chinese and Japanese as laborers have their advocates, and there are some arguments to be advanced in favor of their employment, but they are not ideal as workers in our industry. Their lack of intelligence, their lack of interest in the welfare of our business, besides numerous other arguments, might be cited to prove that their employment is not essential to the best success of fruit-growing.

Of Armenians, Italians, Portuguese, Slavonians, Russian Fins, and other nationalities located in various parts of the commonwealth of California, I can only say that they are approved and disapproved by those who employ them. Comparatively small numbers of them reside in my district, and I am therefore unable to advise.

It is an axiom of industry that the best workers are born on the soil. The young men and young women of California are the best assistants a fruit-grower can find to help him carry on his enterprise. An intelligent, thrifty, energetic, steady, young white man who was raised on a farm can do more work than any laborer a fruit-grower can secure, but unfortunately the supply is not equal to the demand. Energy, thrift, and steady habits are not always characteristic of the white worker. In fact, the white man of California who seeks employment in the orchards and vineyards may be divided into two classes, viz.: the genus "hobo" and the genus "homo." The genus "hobo" can be disposed of in a few words. Improvident and dissipated, though generally intelligent, he comes to you and works as well as the average hand for from five to seven days, when he politely asks you to give him his "time," and with a jaunty air swings himself up to the seat of your already overloaded fruit-wagon and rides to town, there to enjoy himself, until moneyless and hungry he repeats the performance. He is therefore impossible as an orchard "hand."

The young man born on the soil and raised on a farm is our mainstay and reliance. His familiarity with the ways of the country, with the methods of the business, with the use of horses and agricultural implements, and the important fact that he is acquainted with manual labor, make him the ideal employé in an orchard. In the last qualification he has an advantage over the city boy and the clerk. They occasionally seek work in the country, but as a rule they are impractical and come to you without being grounded in the rudiments essential to employment in fruit-growing. It is true they are intelligent and can learn, but you are under the disadvantage of having them learn on "your time." Many city boys are, however, earnest and willing, and often prove a boon to the orchardist in seasons of great scarcity of help.

A shortage in the home supply compels us to ask the farmer lads of the agricultural districts of the Eastern States to come to California to better their conditions by employment in our orchards and vineyards. We can offer them, besides a new country with a mild climate, the certainty of earning good wages and the opportunity of learning an interesting business, and a business that their previous training has eminently fitted them for. It were selfish of us to expect them to accept of our offer of employment if the only inducement held out was the dollar a day and board usually paid orchard workers. The further fact that after two or three years spent in an orchard or vineyard will fit the earnest and energetic young men for places as foremen at better wages, eventually leading to positions as superintendents and managers, at salaries equal to men in similar capacities in commercial houses, will induce many of them to come to California.

Sufficient help for curing fruit, for canning and packing, if not to be found among the young women at home, must also be obtained from the East. Heads of families in farming districts must be urged to look to the Pacific Coast for better conditions. The most prosperous fruit-growers in California are the men with industrious families, living on small orchards of from ten to twenty acres. The family performs all the labor of an orchard or vineyard of that size, and the very fact of the scarcity of labor here, affords the family the opportunity of earning good wages in the more extensive orchards in the vicinity. The larger orchards of California are not as profitable proportionately as the smaller holdings, from the greater expense involved in the larger operations, the present scarcity of labor and the inevitable waste. Unless an improvement in labor conditions is brought about many large tracts must be cut up into smaller places, and thrifty families will be supported thereon.

The best prospect at hand of relieving the present stress of the labor supply is an organized effort to induce a large immigration of young men from the agricultural districts of the Eastern States. As before stated, the training and employment of these young men qualify them at once for work in our orchards. In fact, very many of the successful California fruit-growers of to-day were young farmer boys of the East, who came to California to make their fortunes and eventually devoted themselves to horticultural pursuits. While I am fully aware that there is no surplus of farm labor in the East, the great advertising California has received during the past few years has placed our advantages and greater possibilities before Eastern people generally, and I am persuaded that a united effort on our part would result in a large immigration of a desirable class of settlers. To bring about this Eastern immigration the folly of relying solely on individual effort is apparent. United and prompt action on our part will induce thousands of desirable Eastern people to make "Westward Ho!" their watchword.

I would ask this convention, through its Chairman, to appoint a committee of fifteen, representing the various fruit districts of the State, to adopt such measures as will induce a sufficient supply of workers to come to the Coast in time for the next harvest. By working in conjunction with the Transportation Companies, State Board of Trade, the California Promotion Committee, the Sacramento Valley Development Association, the San Joaquin Commercial Association, the Coast Counties Association, canners, packers, hop-growers, dairymen, and other bodies, much may be accomplished to relieve the labor situation before next season.

The above plan as outlined is feasible, and if promptly and energetically acted upon will prove of great advantage to us before the next harvest arrives. Let us then go resolutely to work to bring to our shores this enterprising class of young men, and heads of families, who only need the proper inducements to become residents of our State.

DISCUSSION ON THE LABOR QUESTION.

A. N. JUDD. I belong to the orchard association of Pajaro Valley, and as the labor question has been touched upon I would like the privilege of reading a resolution, drawn up and passed by the orchard association of Pajaro Valley with a vote of more than four to one, on this subject of labor, as we see it. It is a memorial direct to Congress, but we would feel gratified if the members of this convention would bury any previous prejudices and discuss this question as they see it from their particular standpoint and locality. Of course we are somewhat peculiarly situated, as we raise strawberries eleven months in the year; and while Mr. Stabler was reading his essay, I was wondering what he was going to do with the laborers after he got through with them, and if they were going to be migratory.

MEMORIAL TO CONGRESS.

To the Honorable the Senate and House of Representatives in Congress assembled:

The Pajaro Valley Fruit-Growers' Association of Watsonville, in the State of California, in compliance with the subjoined resolution, would most respectfully but earnestly request that your honorable bodies so amend the Act commonly known as the "Chinese Exclusion Act" that a limited number of Chinese laborers, but sufficient for the actual needs of the farmers and producers, be admitted to this country.

We are well aware that there has been in years past, in the minds of many in certain portions of our State, a deep-seated prejudice against the Chinese as a class or nationality, and their exclusion has been quite generally demanded. This prejudice has, we believe, been created in a large degree for political effect; but such prejudice is fast fading from the minds of the substantial thinking portions of the people of our State, especially the producers and farmers, who feel the pressing need of their labor.

While we do not by any means desire that the gates be thrown wide open to the indiscriminate admission of all who may choose to come, we do earnestly insist that a number of common laborers be admitted sufficient for our actual needs, the number to be determined by a careful investigation of our necessities in that regard. In a word, we favor wise and judicious restriction, but not exclusion.

We have learned by long experience that the Chinaman gives satisfaction as a common laborer in the business where his services are mostly needed. He is industrious, patient, docile, and generally reliable. If the farmer, the agriculturist, the horticulturist, and fruit-grower are entitled to any consideration at the hands of our lawmakers, then we respectfully submit that no more appropriate or effectual way of promoting his interests and welfare can be devised than that which shall afford him an opportunity of obtaining the necessary labor to enable him to harvest and market his crops. If it be claimed that the employment of a limited quantity of Chinese labor tends to degrade American laborers, we say the reverse is true, because the Chinese laborer is usually employed to perform such menial services as American laborers will hesitate or refuse to perform.

These considerations, looking to friendly relations with China, by not thrusting in her face an absolute Exclusion Act, naturally suggests the very great advantages commercially, to this nation, by an unrestricted trade with that vast Empire. But an elaboration of such considerations, even if space would permit, might be out of place here; our principal and primary object being to emphasize the fact that the farmer, the horticulturist, the fruit-grower, the sugar-beet-grower, berry-grower, and the grower of vegetable products generally, are sadly and urgently in need of more common or unskilled laborers. We have waited patiently for years, vainly trusting that the conditions in these regards would improve. We have been paying and offering to pay higher wages than are paid for such services anywhere else in the world. We have endeavored to make terms with transportation companies as to rates, such as would induce laborers to come to us from the Eastern States, but have not succeeded to any considerable extent.

Our demand is not for "cheap Chinese labor"; Chinese labor is not cheap labor; but for labor at any reasonable price, whereby we may save, harvest, and market our crops, after they have been raised.

For several years last past, in the vicinity of Watsonville, and the Pajaro Valley, and other fruit and vegetable growing portions of the State, the industries above named have greatly suffered from the want of necessary labor. For the season just passed, it is estimated that not more than two thirds of the amount requisite to properly handle and market the crops raised could be obtained, and that from twenty to thirty per cent of the crops in many of the places above referred to actually rotted on the ground, and much that was marketed was in an over-ripe condition whereby great loss was sustained by the grower.

And besides, this disparity between the want and supply of labor is constantly and rapidly increasing, so that we have every reason to apprehend that unless some means can be devised whereby the necessary labor adapted to our peculiar wants can be obtained, we will suffer still greater loss. With our genial climate and bountiful soil, so admirably adapted to the growth of the fruit and products above referred to, we may, with the utmost assurance, predict that said products will continue to rapidly increase for many years to come, as new orchards and berry fields are yearly coming into bearing.

Wherefore, we pray that, after the necessary investigation has been made as to our need of more laborers, and our inability to obtain them, under present conditions, the present Exclusion Act be so amended as to admit a sufficient number of common laborers from China to supply our urgent and pressing necessities in that regard.

Respectfully submitted.

PAJARO VALLEY FRUIT-GROWERS' ASSOCIATION,
By S. W. Coffman, Secretary.

RESOLUTION.

At a meeting of the Pajaro Valley Fruit-Growers Association, held in the city of Watsonville, in the State of California, on the 15th day of November, 1902, the following resolutions were adopted:

WHEREAS, We feel a pressing necessity for more laborers to harvest, handle, and market our crops and products, a large portion of which is going to waste for the want of the necessary laborers, and that this necessity is becoming greater each succeeding year, and is so general that from twenty to thirty per cent of our fruit rots upon the ground after it is grown, and when we have exhausted all our efforts to obtain the necessary labor; and

WHEREAS, Long experience has taught us that the Chinaman is better adapted to the kind of labor we need than any other class of laborers we can obtain; therefore, be it

Resolved, That we petition Congress to so amend the "Chinese Exclusion Act" as to admit a sufficient number of Chinese laborers to supply our needs for such labor; and be it further

Resolved, That we recommend the appointment of a commission or committee of agriculturists or horticulturists to make such investigation as to our necessities in that regard, and report thereon.

Attest: S. W. COFFMAN,
Secretary.

MR. JUDD (continuing). It is not a proper subject or one for politicians, because the inborn prejudice is so great. If we can increase the product of the soil of the State of California from three to five fold, as the case may be, will we not also increase the demand for the skilled labor in the same proportion? Now, to come to the point. Of course you understand that a certain class of labor has been degraded by the Chinese to a certain extent, and to-day white labor will not perform it. If you get white laborers from the East they may work part of the season, but will finally take the course that all white labor does—they will want to boss the job. If you can produce four times the amount we do now you will give skilled labor four times the opportunity it has to-day, and if we can do that thing we will do more for the labor unions, carpenters, painters, clerks, and bookkeepers, and every other class of semi-skilled or skilled labor, than could otherwise be done in the State of California.

MR. JACOBS. In accordance with the suggestions made in Mr. Stabler's paper, I move that a committee of fifteen be appointed to investigate the question concerning California labor for the coming fruit season, as also the subject of immigration to this State, to be appointed by the Chair.

Motion carried.

MR. RODGERS. The Pajaro Valley Orchardists' Association, in convention assembled November 29, 1902, adopted the following preamble and resolution:

To the State Fruit-Growers' Convention:

The Pajaro Valley Orchardists' Association, in convention assembled on November 29, 1902, adopted the following preamble and resolution:

WHEREAS, Large areas in our State devoted to fruit-growing are afflicted with pests which threaten to destroy this industry; and

WHEREAS, The fruit-growers are ignorant of efficient methods and means of destroying such pests; and

WHEREAS, The University of our State has at command experts competent and willing to conduct investigations necessary to ascertain the best remedies for such pests, but are prevented, through lack of funds, from extending any aid in this work; therefore, be it

Resolved, That the State Fruit-Growers' Association be requested to petition the Legislature of our State to set aside a special fund of $50,000. Such fund to be used by the agricultural department of the State University in ascertaining efficient methods of destroying the fruit pests.

Resolved, That the Secretary be and is hereby instructed to forward a copy of these resolutions to the State Fruit-Growers' Convention.

MR. STABLER. The most important question now confronting the fruit-growers of California is this most unprecedented scarcity of labor. I know that in our district the prices have been in some instances double, and I was told that in San Joaquin County grape-packers averaged $8 a day. The business won't stand it. The slogan of the fruit-grower is, "Something must be done." Let us take this question of labor and do something with it, if we do nothing else during this entire session. Last spring the railroad companies granted a rate of $25 from Missouri River points to terminal points in California. It brought out 18,000 people over the Central Pacific. Those people were scattered over the State and so absorbed in different localities that the influx was not noticeable. In my own individual case I took advantage of it in this way: I live fifty miles north of Sacramento. Through the intelligence office I succeeded in getting thirty young men from agricultural States east—Illinois, Ohio, Iowa, and Missouri were represented—and I found them to be the very best labor I could get. Some of them stayed with me all season, and I made it a point every time I secured one to find out from him whether or not it were possible to secure larger numbers if they could be guaranteed employment, and the answer was, "Yes." They told me that in the East, California literature was so freely distributed that the sentiment was in favor of California. I am a member of the Sacramento Valley Development Association. Its object is to do what can be done to promote the industries in our immediate localities. We took up the question of supplying the farmers and growers with help, and I was appointed chairman, and I appointed a special committeeman in every one of the eleven counties. Invariably they said it is one of the best things to do, but not one man pledged himself to take a man. The fruit-growers are in favor of all these things, but they are afflicted with inertia. These rates were allowed in September and October, which is a little bit too late for us, and the plan was not a success; but I believe it is the only solution. If there is anything tangible, let us get at it. That is why I suggest in my paper that a committee of fifteen be appointed, and of the fifteen five should constitute an executive committee, and they should go to the transportation companies. In the work I have done, I have gone to the passenger department of the Southern Pacific. These men realize our conditions perfectly and are willing to do everything they can toward helping us. I have been doing a little work on my own responsibility. I am employing a young man at $2 per day and expenses in the State of Missouri to obtain for me a list of one thousand young men raised on farms who would be available for employment in this State. I propose to send them literature and a typewritten letter, which will be as personal as I can make it. And by that time I hope to have enough fruit-growers enlisted in this co-operation to at least guarantee some employment for these men.

MR. ROWLEY. I have had two or three letters from young men who saw advertisements of help wanted, and they say, "We understand the work and are willing to work, but can we procure work all the year round?"

MR. STABLER. I am glad that was brought up. That is why I suggest that this committee be appointed. After the fruit-grower has harvested his crop it is necessary to find employment for the laborer. Now, by interviewing the different associations I hope it will be possible to find that employment. You know in our orchards the pruning comes, then the spraying and the planting, then the cultivating, then the thinning, and in peach districts the thinning requires about as much labor as the picking. Then of course when the picking comes on, all classes are kept extremely busy, and after that the packing comes, and we find in the raisin and prune districts a great deal of labor is employed after the harvest season is over, and that lasts in my district until almost Christmas. So we are extending the time of labor a great deal, but we can also say that the California fruit-growers are not making money all the year round. We must work during harvest for the winter, and I would not feel much put out if I had to ask these young men to lay off a month, but I believe every fruit-grower in this house will agree with me that no active, energetic, thrifty young man in this State need go without work any part of the time if he wants it. He will not get full wages, but something could be made. This is a very important question, and in our valley association we are contemplating the planting of some crop that will extend the working season still further and yet not conflict with what we have.

MR. JUDD. We are confronting a condition, not a theory. The condition is this: We have degraded a certain class of labor, and there is not a man who lives in any agricultural locality who wants to get in and do this work. What is the matter with our own young men, may I ask?

MR. STABLER. We have not enough of them.

MR. JUDD. No, sir; that is not it. They won't work at it. A tramp struck me the other day for a quarter, and I asked him why he did not go to work, and he said, "I am an American, and I believe if there is any loafing to be done the American should do it." I have tried many of these people, and they never work a season through for me, and I have paid them as high as 15 to 20 cents per hour. They will work anywhere from eight to nine months; then they go to town every Saturday night along the latter part of the season and discover that there is such a thing as semi-skilled labor, as I term it, teamsters and such like, who are not getting down on their knees and weeding beets, and then the owners have to sit at home and milk the cows and feed the pigs, and wait until ten o'clock Monday morning before the hired man comes back onto the ranch. Mr. Stabler talks of getting one thousand young men out here. What would we do with a thousand young men? Why, we could use twice that many in Pajaro Valley alone working in berries and vegetables. Our own young people will not work. That is the situation. Let us get the labor that will work and thereby add to our shipments, which could be made thousands and thousands of carloads each year. The Chinese will travel to Los Angeles and back again. They carry out one line of work and do it well. You can not get white people from any section of the country to migrate from place to place where their labor is required. I won't ask any Eastern white man to come to me and work three or four months. I took a little trip back to Denver some time ago, and I found that the fruit-growers of California paid dearly for every emigrant that came to this country, because the Southern Pacific is using all its cars hauling emigrants all over the country, and allowing our fruit to stand on the sidetracks. We have got to have the Chinese—I don't want the Jap. He is simply no good on earth. I have employed them for ten years, and know just what I am talking about.

MR. STABLER. Under the restriction law, there is no Chinese immigration. What is your remedy?

MR. JUDD. Amend the restriction law to the extent that we can get what we want, as many as we want, and no more.

MR. SPRAGUE. I wish to call attention to this fact, that we have got to do something practical. I believe Mr. Stabler is on the right track. If we plan this thing right, we will have the young men from the Eastern farms coming here and working together. There is a big difference between an Eastern boy who comes from the East alone and works among California boys and possibly Japs and Chinese, and one who works with his own friends from the East. I believe this plan which is proposed by Mr. Stabler is the only plan open to us for immediate realization of relief. For five or six years I was an employer of all kinds of men, and I had very satisfactory work from white boys who were brought up to work and who were not ashamed of it.

MR. KELLOGG. Speaking of the fact that we have not work for the Easterner all the year round. Why, they do not have work all the year round in the East, either; it is three months spring and nine months late in the fall, and they do not get something to do all the year round at home. We in California can offer more continuous work to people than any other State in the Union, for the work comes around as described by Mr. Stabler, and then the orange comes in in some districts and fills up almost the entire year. We have all got employment for them. The fruit-growers in our section of the country have not had men enough to carry on their work. Why not try this method of getting our own people here to work. Let us employ our own people—they make good citizens. It has not been my experience that these white men are people you can not depend on in the morning.

MR. RIGHTER. Up my way, we were offered as many people as we wanted, provided we could provide for them when we got them there. The difficulty was in getting them there and providing for them when they were there. They would be glad to go and work in different places, providing there was any provision made to get them there and take care of them decently. We have made no effort to take care of them. The young men in the East have not been used to sleeping except in a bed somewhere; they have not been used to being taken out into a field and told, "There is your bed, twenty acres of it." I am not surprised that these young men say, "What are you going to do with us?" They will not go into a twenty-acre field with the hogs. You can remedy these conditions if you get at it, and provide for people who will work.

MR. BOOTH. I have never wanted for labor, and I hire from thirty to one hundred people during the fruit season. I have never yet wanted for it, and I do not hire Chinese or Japanese, but I do hire women and girls. If you will take these women and girls and treat them as you should treat them, you would have no lack of good laborers.

MR. JACOBS. In this connection, I want to reiterate the fact that we want women and girls. Either directly or indirectly, the fruit-canning trade of California is to-day suffering as much as any other enterprise from lack of help. This question was brought up two years ago at this convention, and a committee of fifteen was appointed, and through its efforts some thirty thousand people came into the State on the colony rate. The committee was then confronted with the problems presented here to-day about continuous employment. They had a proposition from some concern in the East to locate ten thousand families in California, each of these families to consist of no less than two females, and they offered to pay the entire expense of sending them here—the entire railroad fare, and a little money sufficient to maintain them for about thirty days after they reached California. All they asked was that we could assure them that they would be taken care of when they arrived here. Your President will remember the correspondence that took place. We corresponded with different people in the State—the fruit-growers of our committee and with all the largest fruit-growers in the State—and none of them could guarantee any man labor, or would say that they would take any number of these people. We then found that there was a great demand for labor in the manufactories. We went to the canneries, and I believe there we could have guaranteed some of them work for about eight weeks; and, as I say, we went to the manufacturers of San Francisco—of overalls and some of the other lines—and they said they would take some of the labor for a portion of the time, but we met with no encouragement from the fruit-growers. It was our idea that we could bring these ten thousand families here in the months of March and April, and that we would then have them employed either in the fruit canneries or in the fruit orchards until about the 15th of September. It was then our idea to arrange to move them to Fresno or to the other raisin districts, and when they got through there to move them down to the orange sections of the south and to the Oroville orange section in the north. We went to the railroad company again and said, "When we get these people here, how will we get them moved around?" The railroad people said that they would make a rate one third off the regular rate, called a special transit rate, to move these people from one section to the other. We had the matter just as thoroughly discussed as the committee which you are going to appoint will have, but when it came to the guarantee, or the giving of work to these people, no one would stand behind us. The result was we could no longer get replies from many of the large employers of labor in the fruit sections. I had spent $180 in the work, and I suggested to some parties in San Francisco to take hold of the matter. The business men of San Francisco formed what is called the California Colony Association; formed for one year, and they pledged $24,000 to that association. A secretary was appointed and worked in connection with the railroads, and the distribution of literature was undertaken, and during my trip East about that time I found all along in the little stations in the East, circulars and printed matter calling attention to the fact that wages were higher in California than in the East, and that people could live cheaper and better here, and I could see that this association was doing everything possible to bring about the purposes of its organization. Finally this association was changed into what is now called the California Promotion Committee. That committee to-day is expending $2,500 per month in the way of distribution of literature and other means of bringing people here. Now, the question arises, what can the fruit-growers do? Will this committee of fifteen be appointed and be forced to do just as the other committee has done? The result of its work, however, is being manifested here just now. Unless united action is maintained throughout the State, and unless you have a united effort throughout California, from one end of the State to the other, your efforts will end in talk in your conventions. With promise of united support from the fruit-growers, I believe Mr. Stabler has the correct idea. If the people, when this convention adjourns, will take hold of the matter in their respective sections, and let each section form an organization for this purpose, to correspond and co-operate with the committee of fifteen that may be selected, and then let the fruit-growers themselves follow out the ideas presented here, and make presentable positions for these people who may come to the State to look for them, I assure you that there are organizations in the East to-day who will bring from twenty to twenty-five thousand families and pay the railroad fares for them, if the proper inducements are made.

MR. McINTYRE. I will say, in support of Mr. Stabler's proposition, that when I became of age I thought California was the country for me, and I left my home and came out here with what little money I had, and invested it. The first season was a poor one, and I wrote back home to know if I could borrow a little to carry me through, and what interest I would have to pay, and the reply came that I could borrow it, but they would be satisfied if they had the principal returned to them and not the interest. I went to work and paid it back, and have never had to borrow since. That was twenty-one years ago. It proved to me that we could all get along in California. I hire a great many people now, and have never had a Mexican, Chinese, Japanese, or any one else of the foreign class. But I got good white men, treated them as white men should be treated—allowed them to know that they were human beings when they were about the house, and gave them good warm beds to sleep in. I got a good, honest, sincere class of young men who were willing to look for work and who would work when they got it, and I don't feel that we want the class of men who must be guaranteed work and all accommodations before they get here. There is one thing that is very apparent: the work is here for them. We want the young man who will come out here on his own responsibility with the knowledge that there is a reasonable chance of getting work if he looks for it. That kind of a man will succeed, and it is that class of men who will build up California.

MR. CUNNINGHAM. I have never employed labor here. I have been here but a short time. Before I came here there was a young man working for me in Minnesota who had been to California and worked two or three months just a short time previous to the time of which I speak. He said that he wanted no more of California, that they wanted him to take his blankets on his shoulder and go into the stable to sleep, and he spoke very badly of the treatment accorded a workingman in California. In Minnesota we employ men—good men—and they go into the house and are treated as children of the house. If it should happen that they don't behave as they ought to they are discharged. I had a son come out here to learn the fruit business. He stayed here six months and went back home again. He said that he had not been treated much better than a dog by his employers in California.

At this time a recess was taken until Wednesday morning, at 9:30 o'clock.

PROCEEDINGS OF SECOND DAY.

WEDNESDAY, December 3, 1902.

Meeting called to order. President Cooper in the chair.

The President announced as first in order on the program the following paper by Mr. Isidor Jacobs:

TRADE POSSIBILITIES IN CALIFORNIA CANNED AND DRIED FRUITS.

BY ISIDOR JACOBS, OF SAN FRANCISCO.

The distribution of California canned and dried fruits depends on supply and demand. Whenever there is no demand, or the demand is slack, it is necessary to *create* the same in the way most calculated to maintain trade, and to increase it wherever possible. With this objective point in view, so necessary for the future prosperity of these industries, it is necessary to review the situation and conditions existing in the past and the present, and the possibilities of the future. To do this, existing methods must be thoroughly diagnosed. We must benefit by the experiences of the past and present, for these can be utilized as a benefit if properly applied, thus evolving success through these very experiences.

A careful investigation of the methods adopted in the past in the distribution of California canned and dried fruits will disclose that the lack of success was because the element of fear was present, and methods were adopted in order that certain interests might be neutralized. The future prosperity of the fruit industry of California in all its varied and extensive branches depends more upon the proper and judicious distribution of the product than upon any other element. The distribution naturally is closely allied to the question of the right quality and good faith in the designation of the quality of any class of the product which bears the name "California."

I am not a pessimist; on the contrary, have always been inclined toward optimism. But this does not prevent my making the assertion that in order that success may be achieved, the present methods must be carefully looked into, and wherever they are tried and found wanting, they must be replaced by the proper methods.

To get favorable and successful results, a number of elements that tend toward retarding, rather than increasing, the demand, must be eliminated, in order that the products may go into consumption through the ordinary channels of trade with the least friction and in the most direct way. Successful business to-day is conducted along the lines of least resistance, and the men who think they are in a position to throttle others, generally succeed in effectually throttling themselves. The history of trade is filled with the wrecks of men who adopted such methods, instead of following out legitimate business ideas and letting trade conditions, operating from the right standpoint, work out the natural problems of supply and demand.

In reference to the possibilities of trade in California canned and dried fruits, I am not going into statistics or figures, neither am I going to indulge in a lot of talk about having the world at our feet for our market, and the opening up of trade of the vast Oriental countries, or the Siberian hemisphere. We must first master the possibilities of trade close at hand. We must recognize that whatever we get we must work for, particularly in the way of opening up new markets and getting new customers for our products. Rather, let us first exploit thoroughly those markets we already have—maintain our position in them and increase our customers in them; or, at least, keep our present customers.

This country is undergoing the greatest prosperity, and practically everything in the food line has advanced very considerably in value, one of the few exceptions being California canned and dried fruits. The California canned fruit business has by no means increased in the past few years, nor has it by any manner of means kept pace with the growing population of the country. There must be a reason for this. Large quantities of inferior grades of canned fruits are being turned out under labels bearing the general designation of "California," but without any designation as to grade or quality. Many of these goods are what are termed "water" goods, or seconds, and do not contain any syrup, or a very light syrup. This is injuring the sale of California canned fruits generally, because anything by which consumers become disgusted with the quality tends to prevent the natural increase of trade. The retailer makes a greater profit by selling inferior goods to consumers as California canned fruits, but when the consumer sees the quality of the goods he gets, he quits using California canned fruits and turns to something else, perhaps to Eastern goods, and once consumers are lost in this way it is very seldom they can be regained; thus an irreparable injury is done to the California industry.

There was a time when the name "California" on a can of fruit was a designation of superior quality and of fruits packed in heavy syrup. The Eastern packer then began to put on the market goods packed in the East, under fictitious labels, purporting that the contents were packed by California companies. A united effort was made by California canners and injunctions were obtained in the Federal courts and decisions finally rendered which effectually put an end to this fraudulent practice. Since then, the National Congress has passed a law, now in force, which maintains the same principles. This law and these decisions were for the specific purpose of protecting California's fruit industry and for the protection of the name and designation "California" when put on a package of fruit from this State.

While California packers are engaged in injuring themselves by the practices to which I have already referred, many Eastern packers have distinctly improved their grades by packing their goods in heavy syrup and putting them under attractive labels, so that they are being preferred in many sections by buyers. The name "California" as a designation of high-class California canned fruits is gradually losing its value and being undermined. Either inferior grades of canned fruits should not be put out at all by California packers, or else the name "California" should be left off the label, or the label should bear an exact statement of the quality, so that the consumer can know just what grade of fruit he is getting.

The use of the name "California" on these inferior goods does injury to the State and to the producers, for if the trade in California canned fruits falls off, not only the packer suffers, but the producer as well. During the past season many complaints were made on the part of producers about the low prices offered by canners for green fruit, but the fact remains that on account of the large carry-over of canned fruits from last year, the pack for 1902 was the smallest made in years, hence the canners could not use the fruit and it was not a question of price. The remedy certainly is not in starting more canneries, for if those now in the business, with the advantage of established trade in the various markets of the world for their brands, are unable to succeed in distributing their packs, what chance has any outsider who must first build up his brands and his trademarks? It appears to me that it is time California canners awoke from the lethargy and inaction of the past and realized that something must be done to remedy these errors.

The business that does not progress, in reality retrogrades. It certainly is not a healthy condition when canners are compelled to curtail their output on account of being unable to dispose of the goods and are compelled to carry over large quantities from one year to the other. Whenever a business is not prosperous, it is frequently the case that radical changes are necessary in the methods adopted, and such changes could only be productive of good and result in benefiting the canned fruit industry; and, in my judgment, such a change is an absolute necessity if we would see the business expand and increase as it should.

Referring to the future possibilities of the distribution of dried fruits, which includes raisins and prunes, it must be admitted that the sale of these is increasing every year. New markets are being exploited, resulting in increasing the domestic and export trade quite materially, but the financial result to the producer is by no means what it should be. This is because the distribution is conducted under the wrong methods. To make a complete success of the distribution of any article, the producers of that article must be in such a position as will enable them to command the situation.

One can hardly go into the discussion of the future possibilities of the distribution of dried fruits without referring to the co-operative movements among the producers. The Raisin Association has seen the necessity and importance of commanding the situation, hence now have complete control and are able, to all intents and purposes, to handle the distribution of their products.

It is generally admitted that no man is fitted for any form of business activity until he has thoroughly mastered its possibilities, yet it is not too much to declare that in the important part of commercial activity, viz., the distribution of California canned and dried fruits, those who have had the adoption of methods have mastered the subject to so little purpose that they are almost blind to the singular advantages which they might obtain, not only for themselves, but for the general good. If they would only put forth their individuality, and, instead of wasting their time on scheming, self-seeking, and trying to do up the other fellow, would bend their energies and powers toward developing and bringing out all the trade possibilities, then, instead of being faced by what is termed "over-production," they would find that "under-consumption" is the real condition. The whole world contains instructive lessons of lost opportunities. How long are our California producers and canners to face these lost opportunities? There are many evils in the present system which could be mitigated by strong and united action. The producers do not realize their united strength; in many instances, they form co-operative organizations and then proceed to enter into small and querulous differences, which so weaken their unity that presently it falls to pieces and has no more power in it.

No organization lasts that tolerates conflicting arguments or suspicions, and the constant recurrence of quarrels and dissensions only results in harm to the producers and in benefit to those who are frequently behind the scenes and foment these very seeming difficulties. There have been altogether too many discordant elements and too many suspicions.. Give a man credit for good intentions, and don't question them until you find out positively that he is betraying your interests. Work together for the common good, instead of pulling apart for the common detriment. I am impelled to make these remarks by the conditions existing in the prune industry. A product of vast proportions, and an article of commerce that could and should be handled as easily, if not easier than other California products, is in a bad condition, so far as the financial results to the producer are concerned; and this, notwithstanding the fact that this season the French crop is practically a total failure, and a considerable tonnage of the old crop of California prunes has been bought up and shipped to France, as well as very large sales of the 1902 crop, principally of the larger sizes. These have been sold to French speculators and are being shipped to that country. Many will be shipped from France throughout the world's markets as the real French article, and some will find their way back to this country, put up in attractive style, duty paid on them, and be sold as the French article.

Now, what is the trouble with the prune business, and why do not the producers reap more of the financial benefits, or results? The cause is not far to seek. It is the same as was the case with the raisin producers and the orange producers, *i. e.*, a lack of the right methods in distributing the product. This was the reason the California Cured Fruit Association did not succeed. Because it started on the wrong basis from fear of the packers and the handlers, so that instead of commanding or controlling the distribution of its own products, its members placed them in the hands of others to be used as a club with which to knock off their own heads. Business methods which are adopted from fear of others never succeed in bringing about successful results.

The remedy rests with the producers themselves, but some of them have lost heart and others have lost patience at results; yet they themselves are to blame for such results. The only way to succeed in increasing trade and in bringing out all the possibilities is for the distribution to be handled in the most direct way. Handling through the average broker is not a satisfactory method, for those brokers who handle so many different lines do not concentrate their efforts, but devote their time to the lines that are most easily disposed of so that they can easiest earn their brokerage. By commanding the situation and handling their own products, the best and most satisfactory results can be obtained, and when this plan is finally adopted and business is conducted on business lines—the abuses of trade overcome and the right methods adopted—then it can safely be predicted that trade possibilities in both canned and dried fruits will loom up in such a way as to surprise the most optimistic of those interested in the welfare and prosperity of our State.

RECENT PROGRESS IN CO-OPERATION IN CALIFORNIA.

By EDWARD F. ADAMS, of San Francisco.

It is not what co-operators have done, but what they have learned, that is of most consequence just now, and I shall therefore not cumber this paper with statistics. I have not, in fact, tried to collect the statistics of co-operation in this State for a year or two past. I shall attempt, therefore, merely to indicate what seems to me the progress which farmers generally have made toward a frame of mind and habit of thought which will enable them to co-operate effectively and successfully.

I am compelled, for lack of information and space, to omit mention of many co-operative efforts—such, for example, as that for the co-operative marketing, outside the State, of fresh deciduous fruits, and the new movement, originating in Fresno, for marketing dried fruits.

It seems to me, to begin with, that a good many farmers are coming to realize that farmers as a class are not a bit more honest than other folks. Of course, I do not mean that a majority of farmers yet think so, but a good many do. The leaven is working. I have myself heard farmers openly declare that it is as wicked to hide bad fruit in the middle of a well-faced box as it is for the commission man to make false returns for the same fruit when he has sold it. Some say it is worse, because certain to be detected, while you can seldom prove that the commission man has made false returns.

Some may not see the relation of this branch of knowledge to co-operation, but such have not learned the first principle of business co-operation, which is absolute, invariable honesty. There is no hope of successful co-operation on any other basis. Confining the illustration to fruit, about which I know most—or, as perhaps I should say, am least ignorant—everybody knows that the producer can, if he pleases, perfectly separate his product into its separate grades and sell it for what it actually is.

When co-operating fruit-growers establish a reputation for perfectly honest grading and packing they can absolutely rely on taking and holding all markets, for there is nothing on earth which consumers so much desire as pure and honestly packed food products. They can almost never obtain these from anybody but farmers—and as yet very seldom from them. My advice has sometimes been sought by co-operating farmers, and I have invariably replied that the one essential prerequisite to securing the preference of consumers is honest goods—of course attractively put up. I think there has been progress in this direction.

But honesty does not begin or end with honest packing. It is an essential in all transactions. The break-up of the prune association was the result of what may fairly be called dishonesty. I do not mean dishonesty of management—for I have no doubt that the directors have been absolutely honest in their relations to the membership—nor the obvious dishonesty of members who, having contracted with each other to co-operate, deliberately betrayed their fellow members by secretly disposing of their product to outsiders at cut rates for cash. It is alleged that there was a great deal of this, but I do not refer to it. I do refer to a deliberate intent, which I know to have been widespread among the membership, not to permanently maintain their alliance with the packers, but to break away from them on some pretext and do their own packing and selling. It was never possible for the prune-growers to control the prune crop without the aid of the packers, and the reasons are perfectly well known. The packers would not combine with the growers except on terms which seemed to assure them a very substantial profit. While the growers assented to these terms because no others could be had, there was a deep-seated determination to speedily freeze out the packers and dispense with their services. It was expected that the two years' contract would be carried out, although some desired that growers should immediately engage in packing, and the warehouse was authorized to be built as the first step to that end, while the packers' contract was still recognized by both parties as binding. What, in effect, the growers proposed was to secure the assistance of the packers to create conditions which would enable the growers to crowd the packers out. This is the plain English of the matter, and was the underlying cause of the friction which resulted in the contract being repudiated by the packers themselves, upon what pretext I never knew. It was a contract exceedingly favorable to them, and they had no motive for repudiating it, if they expected it to be observed by the growers.

The attitude of the growers was not that assumed by clear-headed business men conducting important transactions. The proposal in organizing the prune association was to acquire control of the prune crop for the purpose of securing higher prices than could be obtained while growers were indiscriminately competing. Such control was, and was known to be, absolutely impossible without the active assistance of the packers. The packers were much more prosperous than the growers under existing conditions; were not, in fact, seriously suffering, and were therefore in a position to name the terms on which they would combine with the growers against the rest of mankind. Obviously a prerequisite to their consent must be the prospect of a permanent arrangement by which they should do the packing and selling at prices to be agreed on by terms of years. They would not, and could not be expected to agree to aid in creating an agency which, after the first year or two, should take over all the packing and selling, and leave them without business. No such proposal was made to them. The alliance proposed, while limited to two years, was never mentioned during the period of organization, except as a permanent alliance between the growers as growers, on the one hand, and the commercial and co-operative packing-houses on the other. The leading packers did exert themselves to promote such an organization, and we must presume good faith on their part, because such an alliance would be greatly to their interest, if satisfactory prices were agreed on for packing. The real intent of the majority of the growers, however, was very soon manifested to be that the alliance with the packers was to be of the most temporary nature, and that as soon as possible the association of growers thus formed by the aid of the packers should itself engage in the business of packing and selling, to the exclusion of the commercial and established co-operative packers.

I am not now defending the packers; I am only incidentally alluding to them; but I do say that among the masses of the growers there was almost total absence of that clear analysis of the situation without which it is unsafe to engage in any business, of the complete meeting of two sets of minds in accepting the logic of the situation, and of the perfect intent in good faith to abide by the conclusions thus reached. Each party desired to gain at the expense of the other. The packers, as their position permitted, got the best of the bargain, and the growers, after the bargain was made, proposed, not to amend the conditions at the expiration of the term, but to absolutely repudiate the compact.

Considering that it is unthinkable that the packers should have entered the alliance except on the understanding that it should be permanent on some basis profitable to themselves, and that the alliance was proposed by the growers and not by the packers, clear-headed commercial honesty required that the growers should have openly announced in the beginning that they did not intend that the compact should endure except so long as would serve to render them strong enough to dispense with the services of the packers altogether.

I regard it as a distinct advance toward learning the art of co-operation that it should have been so abundantly demonstrated that no attempted commercial alliance can have any hope of permanence or success except as based on a complete disclosure of intent on both sides and perfect agreement in accord with that intent. A partnership vaguely understood to be permanent, but really designed by one partner to compass the destruction of the other, must end in uproar and disaster. It is unwise to engage in business with partners whom you distrust; but if you conclude to do so, it is absolutely essential that it be without mental reservation. It is quite possible for parties having adverse interests with respect to each other to mutually ally themselves against the rest of mankind and faithfully observe the conditions of the alliance.

A railroad corporation or a great trust may have frequent contests with its employés in regard to terms of labor, and yet both heartily unite in maintaining the high prices which are the source of good profits and good wages. The fruit-growers and packers might do the same, if both parties were sufficiently educated. The raisin-growers can not materially differ in character from the prune-growers, and yet with a good deal of bickering, and with the same not half-concealed intent of ultimately freezing the packers out, they do manage to maintain an alliance by which both packers and growers make a great deal of money at the expense of the consumers of raisins. And the packers with whom the raisin-growers manage to get along are to a very large extent identically the same individuals with whom the prune-growers could not get on at all. Doubtless there is a difference between individuals in tact and the ability to avoid controversy without material sacrifice; but that is not one of the things I intend to discuss.

The difference in the fortunes of the raisin and prune growers, organized on about identical lines, however, does lead to another line of thought along which there is progress toward co-operation. It has been demonstrated that it depends entirely on circumstances whether a crop can be controlled or not, and whether control can be maintained if once secured. There has to be considered the nature and distribution of the crop and the business education and experience of the growers. The production of raisins, walnuts, oranges, and lima beans in California is concentrated in each case within small and well-defined areas. In that respect they are well situated for crop control. The citrus organization was originally a vigorous and well-sustained effort to control the crop, with the intent to market only so much of it as could be sold at remunerative prices. It failed, after once having virtually secured control, to retain it, because the growers .were not sufficiently educated in co-operation, and also, doubtless, because of pecuniary embarrassments of hard times. But instead of going to pieces like the prune-growers under similar circumstances, it lived, because founded on well-established local organizations and led by men of superior business ability in whom a sufficient number had confidence to assure a volume of business large enough to support organization. Starting out on new lines it achieved its success, not by acquiring a monopoly, but by giving more satisfactory service than could be got elsewhere. On these lines it has grown until as an organization it is entirely independent of crop control, although its management would doubtless be glad to have it. Its existence and that of the Santa Clara County Fruit Exchange and Fruit Unions sufficiently demonstrate that there can be profitable co-operation without monopoly. The raisin-growers secured crop control only after a long series of attempts, by which raisin-growers gradually became educated in business methods and necessities. The years of disastrous competition in the raisin business also worked in favor of the industry by eliminating the weakest and most unbusinesslike and placing their holdings in control, or virtual control, of bankers and other creditors of superior business ability, who applied to the raisin industry the same principles and vigorous administration which they were accustomed to employ elsewhere. They were also greatly helped by the fact that while there is no good substitute for raisins, there is a good market for raisin grapes for other uses, so that the output can be kept down to reasonable proportions. Whether crop control can be maintained will depend on many circumstances. Continued prosperity will rapidly increase acreage, which it may or may not be possible to control. Should the central association break down, chaos would at once ensue, because the movement is not, like the Citrus Association, based on local organizations. The walnut-growers' organization is entirely local, its central organization being a mere conference, with little or no actual authority. But the local organizations are well established, and have always the ability to unite under an effective central authority should more competition indicate its necessity. They are greatly helped by the general intelligence of the walnut-growers and the fact that there is no satisfactory substitute for walnuts. The agricultural industry of the State which would appear to be the most easily organized is that of lima beans. The one attempt which was made, however—some years ago—when beans were cheap, amounted to little or nothing, I presume owing to lack of business ability among growers. The prune industry never had the slightest chance of success on the lines upon which it was projected, owing to the wide distribution of prune orchards, the abundance and cheapness of the substitutes for prunes, and the fact that there is no other profitable outlet for the product of the prune tree. It will not pay to raise prunes for hog feed, brandy or vinegar. I became a member of the association, and did all in my power to aid it, on the assumption that when the impossibility of crop control under a centralized organization became manifest, a large body of local organizations would grow out of it more or less strongly united in the center on the lines of the citrus exchanges, and likely, in the end, to be welded into one really powerful concern, which, without crop control, would yet be a great steadying factor in the market, and gradually grow into something of inestimable value to producers. I did not anticipate the utter wreck which we see, but whose causes it would be unprofitable to discuss at this time. As the result of all these attempts in the various branches of the fruit industry, it is impossible not to discern dearly bought but unquestionable advance in that business education of the masses which is essential to the successful conduct of business by the masses, which we call co-operation.

Another thing in which there has been a decided advance is in the direction of co-operative trading. There is no doubt that the public mind takes an exaggerated view of the profits of retail trading as it has been carried on by men of limited means. We do not see retail tradesmen grow rapidly rich or lead luxurious lives. Their profits in country districts are large, but they need to be large to counterbalance the losses arising from the general system of long credits, which impoverishes both dealers and their customers. There is a strong movement in the direction of the establishment of co-operative stores, called "Rochdale" stores. I have no means of knowing how these stores are conducted, but if really on the Rochdale plan they will prove of inestimable benefit. If, however, they give and receive credit like other retail stores, disaster is inevitable whenever our present era of prosperity gives place to business depression, as it must in due time. The benefit of co-operative trading is not merely the saving growing out of the profit-sharing, but far more in the thrift engendered by the habit of adhering strictly to cash purchases. It is—or has thus far seemed to be—essential to the permanent success of these stores that they should begin upon a very small scale, buying and selling strictly for cash, and building up in the light of experience from the profits of the business. Their success has always depended upon their starting with a certain number of families which could be absolutely depended upon, without cost of advertising or the display of a prominent and therefore expensive location, to make their purchases at the co-operative store and pay cash for them. Small capital means small stocks, which, in turn means few shelf-worn or out-of-date goods, with their attendant loss. It is only by experience that those in charge of a co-operative store learn to avoid buying goods which do not sell promptly at a profit. It is therefore desirable that the beginnings should be very small. Co-operative trading has thus far not, in America, stood the test of hard times, because our people will not generally take trouble to save money, and because they will not confine their purchases to what they can pay for at the time. We are an imaginative people, with great confidence in the future and a consequent willingness to take risks. It is hard for the management of a co-operative store to refuse credit to a fellow stockholder, and it is on that rock that our co-operative stores have generally been wrecked. And it is in prosperous times like these that the bad debts are made, and the obligations of the store to wholesalers created, which involves ruin when the pinch comes. Among farmers there is often great difficulty in making cash payments, especially among our specialty farmers, who take in money but once a year. A credit co-operative store can succeed as well as any other credit store, provided it is managed with the same wisdom and vigor. That, however, will seldom be the case. Salaried employés with little money of their own at stake can usually be trusted to make cash trades, but seldom to give credit and incur debt. I am assuming that the large number of Rochdale stores which have been started are strictly cash stores, and upon that assumption I consider that there has been a very great advance of the co-operative idea. That the movement is making real headway I infer from the following which I find in an Eastern trade journal:

> The Retail Grocers' Association in California is vigorously fighting the co-operative stores. In Los Angeles a strong effort is being made to block the plan of the Co-operative Store Company. This company, recently formed, has bought out Patrick Maroney's retail grocery business for $10,000, and purposes opening for trade on the 21st of this month. The Retailers' Association holds that inasmuch as the store company is simply an organization of consumers, proposing to buy direct from jobbers or manufacturers, such a business enterprise is unfair and prejudicial to the interests of the retail trade.
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> The Retail Grocers' Association has decided to block the co-operative store as effectually as it lies within the power of the association to do. The plan is this: The Jobbers' Association will be called on by the Retailers' Association for a straight yes or no answer as to whether they propose to sell to the co-operative store. Every jobber who answers that he proposes to sell to it will be boycotted by the retail grocers of Los Angeles, and the similar associations throughout Southern California will be advised of this action and requested to follow suit.

The boycott is not attempted against any institution which is not really feared, and no better evidence can be given of the strength of this form of co-operation than the establishment of a boycott against it.

Speaking of the boycott as a means of fighting co-operation, naturally brings up the co-operative movement among the Sacramento River growers for marketing their own products in this city. It is not necessary to discuss the motives of these co-operators. They do not concern us. It is sufficient to know that they decided to exercise their rights as American citizens and to sell their products by such methods as they chose to such customers as they could get. Now the trade situation in this city is this, if I am correctly informed: There is an organization of commission merchants whose rules and understandings are apparently with design made somewhat obscure, but whose result is that the merchants agree upon whom they will sell to and whom they will buy from. This is enforced by a general refusal to deal at all with obnoxious persons. The Sacramento growers had no intention to run a cut-rate store and were willing to be bound by the rules of this association, whatever they may be. They applied for admission to the sacred circle, but were turned down. No reason was assigned, but the obvious reason was that the commission men were determined that no produce should be sold in San Francisco which does not pay a tribute to them. Refusal of admission to the combine meant refusal of any member thereof to buy from or sell to the co-operatives, and also, as it turned out, to sell to any retailer who should buy a dollar's worth from them. But these growers produced but a small part of the varieties of produce which a wholesale produce store must have to supply its trade. They could not buy from the commission men, nor could any retailer buy from them if he bought of the co-operatives. At first the retailers were inclined to rebel, but the result was that they enlarged and strengthened their own organization and came to an agreement with the commission men, freezing out the co-operatives entirely. This probably does not apply to interstate trade, for a single transaction involving interference with shipments outside the State would enable the United States courts to interfere under the Sherman anti-trust law. The situation, then, is that commission men are sure of a satisfactory rake-off from the growers, and the retailers are sure of a satisfactory rake-off from the consumers. The co-operative store is left out of the deal. The net result is high prices to consumers, low prices to growers, and an era of prosperity to the middlemen.

As I write this I have no information about the program of this convention, but I assume that this interesting episode of co-operation will not be overlooked. I shall therefore only speak of the possible ways out of the dilemma, if there is any intention to get out.

One way is to start opposition fruit and vegetable stores in suitable localities and go directly after the consumers. There is no ring among them. This plan would win and would pay expenses, if consumers could be certain of getting attractive and first-class goods packed with perfect honesty. Otherwise it would not. It would be useless to compete in price, so long as commission merchants have the power to sell produce which they do not own at any price they please. By honesty and merit alone can a co-operative store get and hold the trade of consumers. The cheaper grades of produce could be diverted to the neighborhoods where poor people live—but sold there, also, exactly for what they are. This could be done if the money and the brains are available. It is not a thing which everybody could do.

Another means to be used—and which might, in any event, be employed—is to induce the Legislature to enact the Sherman anti-trust law, word for word, except in making it apply to trade within the State. Make the tinkerers keep their hands off. That law has been tested and interpreted in the highest courts, and we know what we can do with it. Congress is likely to amend it, and when it has done so, it will be time enough for us to follow suit. Let Congress lead. I believe that this convention should by resolution demand of the Legislature the enactment of the Sherman anti-trust law verbatim as a State law.

Finally, there is the much discussed free market. The State owns the wharves. It owns some blocks of land adjoining, on which are railroad terminals. The State might provide sheds for selling produce on these blocks, for the accommodation of produce arriving by rail. The bulk of that arriving by river and bay is now sold on the wharves. It is only necessary to provide that no man shall sell a dollar's worth of produce on any State property until he shall have received a permit, only to be obtained by subscribing to an agreement to abide by the regulations of the market, of which one shall be that sales shall be freely made, without distinction, to all who offer the money. There is a law on the statute book which the Harbor Commissioners have never attempted to enforce. It was purposely amended by the efforts of the Pacific Coast Steamship Company so as to enable the Harbor Commissioners to evade its enforcement. The Commission has formally adopted rules for the regulation of sales on State property, which it had printed and then dropped. And the Southern Pacific Company, without the aid of the farmers, is in peaceable possession, without conditions, of the blocks which, a few years ago, it was seeking to acquire, with the aid of the farmers, upon condition that preference should be given to farm produce. I was actively connected with that movement, in the course of which I became so utterly disgusted with the futility of attempting to get farmers to work together that I firmly resolved to be no more guilty of such folly. Incidentally I may remark that the most indifferent farmers of the lot were the very river growers who are now clamoring most earnestly for the benefits which the free market would have given them. During the late lamented political campaign there was lots of "free market talk" and "free market promises." Whether you will get anything as the result of them I have not the slightest idea. The incoming Governor can give you a free market, if he has a mind to, by proper appointments to the Board of State Harbor Commissioners as the terms of the present members expire. He will be, I believe, at any rate, sworn to see that the laws of the State are obeyed, and the free market law is one of them. If I were going to do anything about it, the first thing I should do would be to go to the Harbor Commissioners and ask for a copy of their rules and regulations for the government of the free market, and ask why they were not enforced. The intellectual exercise involved in trying to get a direct reply to that question would at any rate be healthful and invigorating. I may also add that if you want a free market you will have to raise some money to pay the expenses of some one to make the fight. It will require time, attention, and vigorous effort. I worked at it for nothing for some years and paid my own expenses, but there are very few such fools. Besides, my experience finally convinced me that from all standpoints it is unwise to try to accomplish any public reform until its beneficiaries are sufficiently interested to pay the necessary cost of getting it. If you propose to proceed by legislation you will have to have a very wideawake representative at Sacramento, or your bill will get amended into uselessness.

Four years ago you had the Southern Pacific Company with you. Now that they are in possession of the blocks you wanted, and without your assistance, I don't know whether they will want fruit sold there, and agree to deliver it there to be sold, or not. You can find out by asking. It will cost them money to make these deliveries, and you have now nothing to offer them in exchange for that expenditure. I have never noticed that railroads were inclined to spend money without getting something back. All I know is that the road would have traded with you four years ago.

In speaking of the incidents of the year I ought not to omit the attempt to organize a grain-growers' co-operative marketing agency. This started out in a very vigorous way, but came to nothing in the end. Such an association is theoretically as feasible as co-operation in anything else, and could be made practical by making the facts correspond with the theory. The promoters doubtless found that more capital and a higher order of business ability were required than were available to the growers at this time. Ships can not be chartered, loaded, and dispatched to distant markets without incurring a large variety of risks, which must be guaranteed by somebody's capital intrusted to the judgment of men who command the confidence of the financial world, not merely for integrity, but for experience and sound judgment. All grain business is done on small margins, which serious errors of judgment would speedily wipe out, as any one can discover by buying grain options on 'change. I am of the opinion that co-operation in grain marketing must begin in a small way, and grow. No man would be intrusted with marketing a large crop until he had demonstrated his business capacity.

A very interesting feature of the year's progress is the extension of the co-operative art to our inhabitants of Mongolian descent. Lee Yuen, Sam Gee, and their monosyllabic collaborateurs of the San Joaquin potato fields have organized a potato trust—"Alle samee Melican man"—I should say rather the extension of American methods than the practice of co-operation. The Heathen Chinee has co-operated for ages in ways that seem "peculiar" to us, and it is popularly believed that he can give us cards and spades and still win out in the game by reason of the shrewdness of his operations and the silence in which he conducts them. Knowing nothing of the plans of this Chinese co-operative society, I will venture to predict that no outsider will know what it proposes to do until after it has done it—wherein it will set one of the best examples to the Caucasian who thinks himself smarter. "Publicity" is as destructive to the welfare of good co-operators as it is to that of the wicked trusts.

This brings me to the final observations which I shall make. When certain individuals unite for a common business purpose, if we like them—and especially if we are in them—we call them "co-operative societies" or "unions." If we don't like them—and especially if we are not in them—we call them "trusts" or "combines." As a matter of fact, they are all the same thing in desire; they are the same in intent, so far as the intent has promise of success. In economic writings the term "co-operation" means the conscious effort of two or more individuals to accomplish a single purpose. It has no other meaning. The different terms which we apply to the different forms which this energy assumes are merely variants of expression indicating our mental attitude toward different varieties of the same species. We hate the sugar-refining trust, for example, because it, first, seeks to monopolize the industry, and comes very near doing it; second, fixes the prices of its commodity arbitrarily, not only at its own factories, but in the hands of wholesale dealers who buy from them; third, refuses to sell at all to any one who refuses to be bound by all its regulations in buying and selling; fourth, enforces its rules by exacting a price in excess of the real price intended to be charged, and retains the excess if the rules are violated; fifth, endeavors by methods unusual in what has been considered legitimate trade to prevent any possible competitor from marketing its product; sixth, compels the consumer to pay more for the product than he would pay under unrestricted competition. For these practices we denounce the sugar concern as an abominable, atrocious, horrible "trust." The raisin-growers of Fresno do every one of these things, and we call it "co-operation," and rejoice in its success. It is all in the point of view. The dairymen supplying San Francisco with milk have been in strong competition, and prices fell below the cost of pure milk. Their drivers are organized, and recently demanded an increase of wages to correspond with the increase of rents and other expenses of living. The dairymen said—and I have no doubt with truth—that increase of wages was impossible without an increase in the price of milk. So it was agreed that both prices and wages should be increased, and they were. Some of the press reports stated—whether correctly or not I do not know—that the rise in the price of milk was an integral part of the deal between the drivers and the dairymen, whereupon the Drivers' Union adopted an indignant resolution denying that they had been a party to any combination which was to cause a rise in the price of a "necessity of life." Now this was as complete "tommy rot" as to declare that what is wicked in sugar-makers is right for raisin-growers.

During the late political campaign there was much very funny discussion of these matters, but political discussion of economic and social questions is usually funny. It has to be. Now that election is over we can afford to recognize the fact that all rises in prices secured by the efforts of trusts, co-operators, or unions are at the cost of consumers. In a vast majority of cases these increases are necessary and proper, because competition is usually sufficient to prevent extortion. They are right, because it is not to the interest of society that any of its members should work for inadequate compensation. In some cases the increased rates are extortionate. They would be extortionate in ninety-nine cases out of one hundred if those who fix them believed they could enforce extortion. If the prune-growers of this State could compel mankind to buy all their prunes at twenty-five cents a pound they would do it in a minute and jump at the chance. I should for one, and I know it. We are all extortioners so far as we can be—capitalists, farmers, and workingmen alike. What society has to oppose, therefore, is not the exercise of the natural instinct of co-operation, but its abuse. The real trust questions are how to distinguish that which is extortionate from that which is reasonable; and how to prevent what is wrong and promote what is right; how to enable the weak to protect themselves by union without enabling the strong hogs to root the rest of us entirely away from the trough.

It appears to me that we have recently been making great progress toward a proper comprehension of these trusts. Neither the raisin-grower nor the trade-unionist really regards his organization in any other light than that in which stockholders in the steel trust regard their organization. In private conversation they freely recognize the identity of their principles and practices with those of the co-operative unions of iron, oil, sugar, and coal men. For some reason very few, except socialists, will stand upon a public platform and declare what they privately say. Mankind yearns to be humbugged—especially in political campaigns—and the farce of pretending to see differences between trusts, co-operative societies, and trade-unions is kept up in public addresses and newspapers only. But such absurdity can not endure. The time will come when no one can make such distinctions without being laughed at. I am of the opinion that that time is not far distant. When it arrives, popular education in co-operation will advance with great bounds. Sentiment and humbug will disappear from the discussion. Co-operative efforts can be soberly discussed as business enterprises in the light of simple common sense. The natural line between individual and co-operative effort will be made so plain that the most determined socialist must see the folly of attempting to combine discordant elements in one inharmonious whole, and the wisdom of recognizing diversities of human interests and compromising them by collective bargaining. It should be unnecessary to say that I earnestly favor co-operation—even among the rich. I am delighted when it makes gains, and regret when it seems to lose ground. The co-operative spirit is manifesting itself throughout the civilized world—not here any more than elsewhere. It is steadily making progress. At times it makes a step forward, and then a full step or more back. As a rule, it seems to make about three steps forward and two steps back. That represents a steady net gain, whose extent in this State may be seen by all whose memory runs back twenty years. There have been many failures. A great many more are inevitable. But every effort is educational and every failure has its lesson. We are steadily forging ahead, and when we consider not merely our immediate individual interests, but the progress of society toward a final solution of the great social questions, that which we do is seen to be of infinitely less importance than what we have learned. The school of experience is a hard one, but it does give effective instruction, and in it, and of it, and by it, it appears to me that our recent progress in co-operation has been remarkable. We may thank God and take courage.

THE IMPERATIVE NEED OF A TIME SCHEDULE ON EAST-BOUND FRUIT CARS.

By EDWARD BERWICK, of Pacific Grove.

It is impossible to do business on an intelligent basis when one of the factors is an unknown quantity. When several unknown quantities enter into a transaction that transaction becomes a gamble.

Incidental to the career of the fruit-grower, there always has been, there always will be, at least one such unknown quantity. The mysteries of meteorology have eternally baffled, and seem likely to baffle, the keenest of our weather experts. In spite of all our best efforts, the heavens will sometimes withhold the moisture needed by the parching earth, untimely frosts will chill the tender growth, blasting northers will blight the blossoms and ruin fair hopes of a plenteous fruit harvest. Other unknown quantities are the extent of the annual depredations of canker-worm and caterpillar, aphis and grasshopper; though these are minor ills that intelligence and foresight may meet and modify. The abundance and scarcity of fruit in other districts and countries, near and remote, is an additional conundrum; for disaster, as this year's experience in the French walnut crop shows, will sometimes wipe out an abundant yield, almost ready for harvest.

Nor have I yet catalogued all the uncertainties inseparable from the business of the horticulturist; the supply of labor, its remuneration, and various other matters, will occur to many of you.

What I am now about to do is to point out one of the most dangerous of these unknown quantities, but one *by no means inseparable or unnecessary;* and one which, for that very reason, is the more vexatious and discouraging.

I have no wish to refer to it in any spirit of acrimony, but simply to state the case from a business point of view. There is nothing new, unhappily, in what I am going to say. It is an old, old story. It runs thus:

After successfully meeting all the vicissitudes incidental to the growing of a good crop of fruit; after deciding what place offers the most promising market; after packing and loading his goods in the most approved manner, the grower commits his produce to the tender mercies of some transportation company. Before this company will undertake the service of carrying the fruit to market, the grower must guarantee, absolutely, the freight charge. Now if this service is to be really a service it must be performed strictly in a limited time; otherwise the so-called service is a non-service; it is an injury; the grower's produce is ruined.

But no matter how carelessly delayed, or how utterly ruined, the transportation company still demands the same compensation as it would have been entitled to had it rendered a real service to the grower. The injustice of this is apparent. Obviously, if the grower or shipper guarantees the value of the service, he is entitled to a guarantee that the service shall have value, shall be a real service and not a non-service. Annually, in our Fruit-Growers' Convention, we are assured by some representatives of the transportation companies that in the coming season these companies will amend their ways and that we may reasonably expect that our produce will reach Chicago in six, and New York in eight, days. Such an assurance was given in my hearing last year.

One has only to turn to the columns of the "Fruit World" to see that from various California terminals, 12 days to Chicago and 14 to New York have been more usual times. Here is one day's list of times of transit: New York 13, Boston 15, Chicago 11, Philadelphia 13 and 14, Pittsburg 19. Here is another: New York 15, 13, 14, 15, 14, 13, 14; Chicago, 12, 14, 15, 13, 13; Boston, 16, 16; Philadelphia, 15, 16; Baltimore, 20; New Orleans, 12; another day there is reported a car to Boston which took 38 days.

The general public do not realize what such delays mean to the fruit-grower. In the first place, delicate fruits can only be safely transmitted during most of the season in refrigerated cars. But the transportation companies have not in the past owned an equipment of such cars, and will not even undertake their due refrigeration. Sub-companies owned both the cars and the icing stations; but the transportation company will arrange to pay their charges on the shipper guaranteeing the same. The shipper, it will be seen, does practically all the guaranteeing, for the company will not even guarantee that a car of fruit will reach Chicago in a month after the date of leaving California terminals.

Even if anything was guaranteed as to the proper arrival of the fruit, this division of labor between the refrigeration and the transportation companies would of course mean divided responsibility. The transportation company would claim that fruit that was delayed and arrived in a "wasty," unsalable condition, would have been all right if properly refrigerated, while the refrigeration company could claim that the car was amply iced if the proper time had been made.

Not only does loss accrue from the actual damage to the fruit—of course all know that rotten fruit is practically useless—but you can spoil a good market as effectually as you can spoil good fruit. A delay of eight or ten days may make all the difference between an early, empty, high-priced market, and a market glutted by an over-abundant home supply of the same class of goods. Or, a market that would readily absorb a succession of carloads at proper intervals, is ruined for the producer's purposes by having several overdue cars of the same varieties thrown upon it at one time, this, of course, causing such a glut as to make all the shipments unremunerative.

These are not any fanciful or exaggerated possibilities; they are, unfortunately, the oft-repeated realities but too fresh in the memory of all shippers of green fruits. One such writes me: "I am very glad you are taking up this matter, and trust we shall succeed in making some impression upon the transportation lines, for this is the most serious thing connected with the fruit industry at the present time. The icing stations are arranged on the theory that a car will go through between stations in, say, thirty-six hours, and in very many cases it takes seventy-two hours or one hundred hours instead, which results in the ice getting low in the tanks, making a serious change in temperature, resulting with a breakdown of a part or all of the fruit. We may safely suppose that the difficulty between here and Ogden will be less in another season than this, as many of the delays have resulted from the extensive repairs on the Central Pacific." Another sends clippings from the "Fruit World," showing excessive time on many cars, and adds: "You can find plenty of such as these in other numbers, and even worse. I can not make specified statement of cars, as I notice the railroad officials at once trace them to their source, and I can not afford to have their ill-will." This seems to imply a demand on the fruit-grower for something more than Christian meekness. He must not even seek for public sympathy in his long-endured suffering, but must keep his mouth shut or incur the ill-will of the railroad officials. The fear of this ill-will of course implies that the ill-will may cause pecuniary injury to those so unfortunate as to be its victims. These officials are bright, intelligent men, keen to see and appreciate the business situation. I wonder how they would feel if they were to change places with the fruit-growers for a year or two? They perhaps would come to a realizing sense of one or two things of which they now seem to be willfully ignorant. One of these is that the fruit-growers of California already produce more fruit than can be handled with profit to the grower in an average season. This may be a debatable proposition, but the best proofs I can bring are the huge record of mortgages on orchards and the experience of the average grower. In spite of this, the railroad companies continue to flood the East with literature assuring the readers that fruit-growing in California is an easy road to affluence. Of course, a glance at the columns of the "Fruit World" would show cars by the dozen that sold for actually less than the charge for freight, leaving the grower a heavy bill to pay for commission, packing, boxes, and paper, added to the original expense of growing and picking the fruit. But as a rule, the intending immigrant has not the means to verify or disprove the statements he encounters in this "boom literature." He is, moreover, sanguine and unsuspicious, a "tenderfoot."

Another thing the railroad official turned orchardist would learn would be that time is necessarily the essence of the fruit-growers' contract with the railroads. Greater time means greener fruit and greater risk in all ways.

Fruit and vegetable products from California eastward-bound now foot up some 65,000 cars. Averaging these at only $300 apiece, for freight, there is nearly $20,000,000 annually paid by California growers to the railroad. This is a tolerably good-sized golden egg, and it is not policy for the railroad to kill the goose that lays it. It is not always politic to be over-exacting, even when one has the power. It pays to conciliate clients. It is just as possible to run freight trains on schedule time as to run passenger trains thereon. I am told that consequent on the action of the society for the prevention of cruelty to animals there are cattle trains run in the East on even better time than the passenger schedule. I believe rates on cattle are much lower as a rule than on fruit, and cattle trains are much more costly to operate. Prevention of cruelty to the California fruit-grower demands that his produce should be given transit time approaching that given to cattle trains. That it can be done, there is no doubt. The best proof is that it sometimes is done. Cars have gone through this season from Sacramento to Chicago in seven days, to Minneapolis in six days, to New York in nine days, and to Pittsburg in nine days. This approximates to the time Mr. Sproule gave shippers hope would be ordinarily made throughout the year. Instead of this, however, something nearer the average was Sacramento to Chicago 10 days, Minneapolis 9, New York 13, and Pittsburg 12. Some of the longest being, Chicago 13, Minneapolis 12, New York 16, Pittsburg 17, Baltimore 20, and Boston 38.

In no solitary instance, so far enumerated, has the time of six days to Chicago and eight days to New York been made. I should say I have no complete statistics, for the Southern Pacific Railroad Company wrote me: "We do not keep any record of the time on fresh fruit in transit in a manner that would enable us to furnish information in the shape that you desire. The record would need to be very voluminous to do so."

It is evident, however, from the foregoing figures, that it would be quite possible for all cars to go through on the minimum time quoted, and there is no doubt they would do so if the loss consequent on the delay were chargeable to the railroad instead of to the shipper. But, as it makes no difference to the railroad's receipts for freight, whether a car gets to Boston in eight or thirty-eight days, the shipper's interests are disregarded and his goods side-tracked to suit excursion or other traffic, as fits the convenience of minor officials of the companies.

It is idle to say this can not be effectually remedied. In would be remedied, *certainly* and *immediately*, if the loss from needless delay were made chargeable to the transportation companies. There should be a clause in all shipping contracts acknowledging that time is the essence of such contracts, and restricting the shipper's liability for the freight charges to the arrival of the goods within a definite time limit. If this limit were so far exceeded that the shipment became of decreased value consequent on the delay, the transportation company should be liable for the damage.

Of course I shall be told that this will be done when the millennium gets here. Well, I'm one of those who think the millennium will come just as quickly and effectually as we believe in it and work for it. Working for a thing is the best proof of real belief. Show your faith by your works!

The essential point is for the shippers to know what they want, and to know whether it is possible and right for them to get what they want. The next step is to formulate their demands and to insist that legislation be so framed as to compel common carriers to conduct their affairs on a just business basis and not to permit them to charge for a *non*-service the amount legitimately due for a *real* service only.

Here I may be met with the rejoinder that the railroads own alike the legislatures and the whole political machine; that to expect fair treatment from them is ridiculous. If this is true, it simply emphasizes once more what many of us have so often striven to impress on previous conventions, that if it comes to a question of railroads owning the people or the people owning the railroads, the latter proposition is unmistakably preferable. To say it can not be done, subject to proper civil service rules, is to belittle this government and this nation. The right of eminent domain still inheres in the people and can be exercised in their own favor, and adversely to the corporations. Other governments, other nations, successfully operate their own railroads, the high-roads of to-day. Why can not we? It is simply a matter of popular education.

Another line of argument that may touch the railroad officials in a tender spot is the possible decrease of fresh fruit shipments. Men tire of a gamble that is one-sided. The grower or shipper can not afford to lose his fruit, his boxes, his own and his packer's time, in return for the privilege of paying for the freight and refrigeration charges on fruit which arrives at its destination either too green or rotten.

The assurance which we are given at every convention, that the interests of the railroad and the fruit-grower are mutual, is doubtless flattering and touching, but it does nothing to decrease the mortgages on our orchards. I even have a slight suspicion that the very urbane gentlemen who represent the railroad company on these occasions sometimes laugh in their sleeves at the credulity and endurance of that most plodding and patient animal, the California fruit-grower.

Booming the fruit business has been and is a trump card with railroad editors. It brings grist to their mill; cash in hand for immigrants' fares, and hopes of increased freight in the future. Booming usually partakes of the nature of some distorted or exaggerated half-truths, which are hard things to fight.

As an anti-boomer, I should like to know how many fruit-growers in this hall have this year received a fair interest on their money invested and adequate remuneration for their own time and ability. And I should like intending immigrants to be fully advised that it requires not only considerable capital, but also no small measure of ability, to make head against the many adverse conditions which beset California fruit-growers. Perhaps one of the most adverse is the lack of a time schedule on East-bound fruit cars.

I can not conclude without expressing the hope that the freight traffic managers of the various transcontinental lines may be induced to see the fruit-growers' side in this matter; may recognize the imperative need of such a schedule, and realize that the demand for it is founded in justice and equity.

"Heads I win, tails you lose," is not the motto for an enduring mutuality of interests.

FRUIT PACKING, MARKETING, AND TRANSPORTATION.

By GEORGE D. KELLOGG, of Newcastle.

The subject assigned me for this paper is a great one. Divided into separate headings, each would be a subject for a paper. Coming at once to the propositions, we take up in the first subdivision:

Fruit Packing.—This of necessity carries with it careful picking, selecting, grading, and packing. It does not seem possible that anything new can be said or thought upon this matter. From New York to the Golden Gate, the country is becoming too rich in fruits to take many chances in the case. Yet we have been deceiving ourselves for many years by permitting careless and indifferent selecting, grading, and packing of fruits shipped from California. In the matter of uniformity, neatness, and convenience of packages in which to pack our fruit great progress has been made within the last decade. But we have not been vigilant enough in guarding against the promiscuous and indiscriminate picking, selecting, grading, and packing of our fruit in the past.

It has been hinted that there were those who, through mistake, or intention, have brought fruit to market when the lower tier in the box was inferior to the top tier. Possibly the boxes have been nailed wrong side up by the boy who nailed them; nevertheless, in more than twenty years of experience as a fruit shipper, I have had not *less* than three such cases come under my personal observation. Within the last season I had occasion to load a car of cannery peaches. A grower who professed to have some extra fine peaches was to avail himself of the opportunity to enter into this shipment and obtain the highest market price. He came in with his load at the wrong time to place in the car. The peaches as they showed in the lug boxes indicated that it was truly a loss that the car could not include this load; everything appeared to be the prescribed two and a half inches in diameter, and over, and very perfect. Under the very severe protests of the grower this load was sent to the local cannery, with the assurance of just the same price as if it was to be shipped to the distant cannery. Of course this fruit had to be graded and the lugs emptied. This revealed the fact that two miles of foothill roads had shaken all of the peaches two inches and less, and all of the split pits, wormy and green peaches to the bottom of every lug. Of course this caused a shrinkage in weight of the fruit which was suitable for cannery purposes, and gave the cannery a very low reputation in the estimation and outspoken opinion of this said grower. That man deceived himself; he did not realize it when filling his lugs. But what of the man who sends his fruits to an Eastern market, where there is a series of tariffs adding to the cost of his box from thirty-seven to ninety cents, and who will pack in that box any fruit which will not bear the closest of inspection? The fruit is opened and displayed upon the market; the poor and the imperfect are discovered. The consumer avenges himself upon the consignor by buying all of the good, as well as all of the bad, fruit in that display at a very low price, possibly at a price that will not cover the cost of freight, and other charges; it means a loss to somebody.

Or, take it in the other way; it is sold without detection. The consumer opens the box at home and discovers the deception. He at once notes down where that fruit came from, and estimates that all the fruit from that section is of the same class; he condemns it all together and seeks to get even on the next purchase. A loss somewhere is bound to ensue. There should be some system evolved that will insure against such a pack being permitted to leave the station where it has been put up.

Proper packing involves the retroaction of proper spraying and thinning of the fruit months before the packing begins, in order to put the fruit in proper condition for packing when it has matured.

There ought to be grades of deciduous fruit established, as there are grades of oranges; by number or name any fruit may be known and the grade to which it belongs. A peach should never be shipped, after the Hale's Early crop has been harvested, smaller than ninety-six to the box; this means eight peaches on a side, six rows wide and two tiers to the box, of course. Eighty-four, seventy-two, sixty, and forty-eight are better. If none other were shipped the reputation of California peaches would be raised; we would get more money for our crop, pay less for hired help and for freight, with a prospect that California peaches, under such conditions, properly selected, graded, and packed, would be in demand in any of the principal markets, regardless of supply of local fruits. The same can be said of any other fruit we raise, by carrying out the same thought in a legitimate way, changing to conform to the requirements of conditions and class of fruits.

If this convention could so grade and systematize the packing and grading, and would adopt some method by which it would be understood, by some name or number, just the grade of fruit you are handling, it would be a long step in advance.

Like everything else, you have to begin right to pack a box of peaches properly. If the upper and lower tiers are packed with broken joints and of uniform size, your peaches will present a neat appearance; they will not be nearly so likely to bruise, the box will be well filled, and will not shake loose until the cover is raised.

Marketing of the fruit is the second proposition given me. Discussing it from a grower's or a shipper's standpoint makes but little difference; the proposition is the same, the interests are identical. The prosperity of the shipper always means the prosperity of the grower, and is due to the careful selection of the markets and the proper distribution of the fruit.

To the grower I would say: One of the important things to make a success in marketing is first to select a shipper in whom can be placed confidence; then stay by him and help him to establish a desirable brand and to work out some of the problems he at times may have to solve. Often he has to make concessions in exploiting new markets and in meeting local conditions on the market that you would do well to help him meet, as in the end it might be that he has gained a point which will inure to your own best interests. He builds up a trade by knowing that he can rely upon your pack of fruit. You and he are alike injured if you fail to stand by him at the proper time. Beware of the spasmodic buyer who can well afford to give a few cents more for some certain line of fruit when he chances to have an order for a car, and who can not take care of your interests when his order has been filled, or provide for your other lines of fruit. The man who has stood by you in times of plenty deserves to have the principle of reciprocity applied when there is a demand for your product.

These are days when co-operation becomes a necessity, with all the perils of the California fruit business, owing to the world-wide competition that has to be met. So, in my opinion, I would insist upon the fruit being marketed through legitimate channels of the widest circle of co-operation possible, and would therefore advise the concentration of the control of all fruit as much as possible. It certainly can be demonstrated that a strong central organization may be made to serve the purpose of every shipper, and permit that shipper to maintain his identity, and be as nearly independent as the best interests of the fruit industry will permit. In this I am not advocating a fruit trust or a combination that will work injury to any one interested, but for the purpose of regulating the market. The season of 1902, perhaps the most peculiar and the one most trying in our experience, would probably have been much more disastrous had not a large percentage of the output of the State been carefully guarded to keep some of the markets from overflow, and exploiting and furnishing others not properly supplied.

There is no question but that every organization now shipping fruit from the State has clearly demonstrated its right to exist; but if all of the fruit interests in the State could be harmonized, and through one system of general information a complete knowledge of the wants of every market obtained, with a central power to divert any cars to avert conflict, or crowding, in any market, and to keep neglected markets supplied, see what an advantage would be gained thereby. Of course I am talking now mainly to the shippers. Through such an organization, for the purposes of co-operation and self-protection, the abuse of the power to reject cars on some flimsy pretext would not necessarily have to be submitted to. The power of such a central body could eliminate altogether unjust rejection through concert of action and the application of a correct business principle of requiring the consignee's acceptance of the car, protect the drafts, and file claims with proofs of alleged damage, which could be settled justly through the same central body. The man who would object to this proper way of settling the matter would necessarily have to retire from the business of handling California deciduous fruits for a living. It can only be reached through co-operation; it is perfectly feasible when based upon mutual confidence in each other's integrity.

Whether the f. o. b. or the auction plan is better is a question of localities. My judgment is that there are legitimate fields for each, and that as much as possible one must not interfere with the other. This, however, can only be regulated through co-operation and proper distribution. I am more than half persuaded that there are auction points now that should be converted into f. o. b. points. There possibly may be some few places where auctions should be established where they are not, but I could not suggest any such at this time. The auction seems to be a necessity in some of the great centers and a valuable method of marketing fruit at such points. I therefore commit myself to the approval of auctions in the larger centers, under some regulation whereby they shall not harm legitimate f. o. b. fields, which should cover the greatest portion of our fruit shipments.

Transportation.—Having noted upon the program that there are others to discuss this subject, I will not go into detail, as I otherwise might. Upon one point we will all agree, and that is that the cost of transportation is high and surrounded by many difficulties which often bring us disaster. If a reduction in freight rates can be obtained without being done at the *expense* of the service, I would say most emphatically that the fruit interests of California demand it. Of *more* benefit to the fruit interests of California to-day than reduction of rates is that of *good service;* when trains will be started out on *regular* schedule time, and run on schedule through to destination. My experience and observation lead me to affirm that a greater loss of money has come through failure of transportation lines to run cars closely on schedule than through high freight rates. I should hail it as a glad day if we could see a reform in both rates and regular time; but, if we can not have but the one, let us call for a reform on that line which loses us most money, viz., *irregular* and *unreliable* time.

The poor service with which we have had to contend in the past has cost the shippers loss in reputation and untold amount of money through being unable to place cars of fruit in the markets at the proper time. Markets have depended upon certain cars for a given date; by being delayed in transit a day or two the market is disappointed by having no fruit. Other cars are billed for that market; two days later both shipments arrive at the same time, and the market is over-supplied. The two cars have to be disposed of practically at the price of one, often; and always at the expense of the first car shipped. Two freights have been paid and but little better than the price of the one car obtained, when if each car could have been sold on the day it was desired a profit instead of a loss would have been entered.

I would accept of a *reliable* schedule of nine days to Chicago in preference to a seven days' time-card, with no certainty of its accuracy. I do not wish to be understood as advocating a nine days' delivery to Chicago, by any means. I am only accepting of a *certainty* in preference to an *uncertainty.* We should insist upon a reliable schedule of never to exceed seven days to Chicago, and I believe it is not unreasonable to insist upon the carriers bringing the time down to a *reliable schedule of five days*, at present rates, when we consider the competition with which we have to contend and the vast interests of the fruit industry in California. We want to be just, and expect to receive justice.

Refrigerator cars and cold storage have proven themselves very important factors in the marketing of our deciduous fruits. A good system has been provided us, for which we have paid liberally.

It has been published that the Southern Pacific Company has entered into contract with the Armour lines for a term of years to supply our wants for cars in which to transport our fruit to the Eastern markets. Until the railroad company can supply the equipment to be furnished without additional cost to shippers in freight rates, I feel that perhaps we might find cause for rejoicing and approval that they have established a system that is already complete with icing stations and experienced management and that we are not compelled to accept of any experiment or new ills that might confront us. We can accept the Armour lines as being well established and equipped, with no excuse for rendering anything but the best of service, which in the fruit business is the imperative need of the hour.

REPORT OF CALIFORNIA FRUIT DISTRIBUTERS.

BY HON. ALDEN ANDERSON.

SACRAMENTO, CAL., November 25, 1902.

HON. ELLWOOD COOPER, *President of State Board of Horticulture, San Francisco, Cal.:*

DEAR SIR: Pursuant to your request we hereby present a report of the shipments of fresh deciduous fruits made during the past season from the State of California to Eastern distributing points.

In presenting this report we beg leave to advise you that same is absolutely correct as regards shipments made by growers and shippers reporting to this company.

The small percentage of shipments otherwise made, of which we have no cognizance, was secured for statistical purposes from the transportation companies at a remote time subsequent to date of shipment, and we do not know and have no means of ascertaining how many cars were diverted from original point of shipment. Our figures, therefore, in regard to this small percentage, which is added in with the whole, are only approximately correct.

The first car to leave the State consisted of cherries, and left Vacaville May 13th, twenty-one days later than the first carload shipment of the previous year.

The last car, to date, consisted of a car of grapes from Concord on November 24th.

The lateness of the season worked greatly to the disadvantage of California growers this year, particularly for two reasons: First, the different fruit-growing districts in California ripened their fruit more nearly at the same time than ever before, and thus we had solid cars of the same variety of fruit leaving California at the same time to a greater extent than ever before. In other words, it did not allow the earlier districts to get through with their varieties of fruit before later districts began their harvesting. Secondly, it threw a great amount of our summer fruits into active competition with the summer fruits in the East, and as all fruit districts in the East had good crops and same were marketed under unusually favorable conditions, it made high prices for California fruits at that time impossible.

Following is a résumé of shipments by varieties:

Cherries: 245 cars were shipped, as against 110 in 1901. Returns on the whole were very satisfactory.

Peaches: 1,777 cars were shipped, as against 1,901 cars last season. Prices did not rule high. Competition with Eastern crops partly, and poor railroad service were the principal causes. On the whole, prices were not as bad as they have been in times past, and some varieties made good returns.

Plums and Prunes: 1,478 cars were shipped, as against 936 for the previous season. This variety shows a large increase. It was a plum year in California, and all the trees in every district seemed to have borne to their fullest capacity. Added to this was the fact that the same varieties of plums and prunes were, as before stated, being shipped from all shipping districts in California at the same time; the result was generally poor returns for the bulk of shipments.

Pears: 2,011 cars were shipped, as against 1,535 for previous year. Fair crop in all sections, except the San Joaquin Valley. This was especially true of the Sacramento River region. Range of price was low and there was complaint of fruit arriving over-ripe, due to slow time made by transportation companies.

Apples: Our report only covers a portion of crop shipped. Our figures give 359 cars, as against 739 cars compiled by the Fruit-Growers and Shippers' Association last season.

Apricots: 222 cars, as against 201 for previous season. Apricots were used quite extensively for sorting carloads, and such shipments gave satisfactory returns. The later shipments of straight carload lots were not remunerative.

Grapes: There have been shipped to date 1,033 cars, as against 966 last year. These shipments were kept well distributed, and sales have been uniformly satisfactory.

Besides the above there were shipped 10 cars of quinces and 6 cars consisting principally of figs, nectarines, and persimmons, making a total for the season, to date, of 7,141 cars.

The above were distributed as follows:

Chicago	1,301	Cincinnati	51	St. Paul	267	England	156
New York	1,475	Kansas City	101	Omaha	165	Scotland	9
Boston	745	Montreal	102	Cleveland	101	Mexico	1
Philadelphia	295	New Orleans	165	Pittsburg	278	Minor points—	
Minneapolis	419	Denver	104	Buffalo	28	Canada	143
Baltimore	63	St. Louis	94	Milwaukee	68	U. S.	1,010

Very truly yours,

ALDEN ANDERSON,
Manager of California Fruit Distributers.

REPORT OF COMMITTEE ON PRESIDENT COOPER'S ADDRESS.

The following report was read and unanimously adopted:

SAN FRANCISCO, December 3, 1902.

To the Fruit-Growers' Convention:

We, your committee to whom was referred the President's address, hereby beg leave to report as follows as to the recommendations:

First—That this convention favors the earnest co-operation of the fruit-growers of California in an extensive and varied exhibit of all of California's products at the Louisiana Purchase Exposition at St. Louis, and we request the forthcoming Legislature to make a liberal appropriation for that purpose, and the Secretary is requested to notify the Legislature of the action of this body.

Second—We emphatically protest against any change in the present protective tariff, either by reciprocity treaties or otherwise, that may injuriously affect California industries or productions, and the Secretary shall at once inform the California delegation in Congress of the action of this convention.

Third—In regard to the President's recommendation as to the appropriation for procuring parasites for predaceous insects, we heartily concur in the same and recommend an appropriation, by the State Legislature, of $10,000 for that purpose.

Fourth—As to the recommendation of President Cooper regarding pure food laws, we recommend that the present pure food laws and olive oil laws have the special attention of the forthcoming Legislature, and that said laws be so amended as to provide for the enforcement of them by and through a State Food Commissioner, and under the supervision and by appointment of the State University. That said commissioner, by and with the consent of said university, be empowered to prosecute all violators of the said laws, and that an annual appropriation of at least $10,000 be set apart for this purpose, together with such sums as may accrue as a result of violation of said acts. The said fund to be used for salaries of State Food Commissioner and chemical laboratory work by said university.

Fifth—We approve President Cooper's recommendations for the control of the shipments of fruit and fruit products, by having a proper label on every package, indicating the quality or grade; also, that the marketing of artificially-colored olive pickles be prohibited by legislation, and that the marketing of oils for table use that are adulterated, or any substitution, unless labeled according to the amended olive oil act, be prohibited.

Sixth—As to the recommendation regarding fruit distribution, we believe that this subject is one of the most important now facing the fruit-growers of this State, its future prosperity depending upon the proper methods to be adopted. We believe that district co-operation will largely solve the problem and will prove a solution of the question.

Respectfully submitted.

M. J. DANIELS.
F. M. RIGHTER.
ISIDOR JACOBS.
H. P. STABLER.
B. N. ROWLEY.

HOLDING TWO CONVENTIONS.

MR. ROWLEY. I have a resolution here, signed by H. P. Stabler, recommending the holding of two Fruit-Growers' Conventions annually, as follows:

Resolved, That we, the fruit-growers of California, in convention assembled, at San Francisco, December 3, 1902, believe that the former custom of holding two Fruit-Growers' Conventions annually would greatly redound to the benefit of the horticultural industry, and we ask the State Board of Horticulture to call a State Convention of Fruit-Growers, to be held in the southern part of the State, at a time and place to be designated by the State Board of Horticulture.

The resolution regarding the holding of two conventions annually, offered by Mr. Stabler, was adopted by the convention.

REPORT OF COMMITTEE ON RESOLUTIONS.

The following report of the Committee on Resolutions was read and adopted:

Mr. Chairman:

Your Committee on Resolutions, to whom was referred the resolutions adopted by the Pajaro Valley Orchardists' Association, has given the same careful consideration, and respectfully refers the same back to this convention and recommends their adoption, except as to the amount of money to be appropriated. In the judgment of your committee, the amount should be $20,000 in place of $50,000, and be divided equally between the State University and the State Board of Horticulture, to be expended in conformity with the resolution.

Your committee further recommends that the chairman of this convention appoint a committee for the purpose of drafting a suitable memorial to be presented to the incoming Legislature, in conformity with the resolutions.

B. N. ROWLEY.
EDW. M. EHRHORN.
A. N. JUDD.

The following report of the Committee on Resolutions, relative to the report of the Committee on Nicaragua Canal, was submitted:

Mr. Chairman:

Your Committee on Resolutions respectfully refers back the following resolution, and recommends its adoption.

B. N. ROWLEY.
EDW. M. EHRHORN.
A. N. JUDD.

Resolved, That this annual convention of California fruit-growers, assembled the 2d day of December, 1902, in San Francisco, hereby records its satisfaction at the appropriation, by Congress, of the funds needful for the construction of an isthmian canal.

But, while we recognize that the construction of a canal at Panama will add greatly to the commercial facilities of the world at large, in which the people of this country will participate, we declare that it will be no such advantage to those who will pay for its construction and contribute three fourths of its business, as a canal constructed by the Nicaragua route, as last surveyed by the Isthmian Canal Commission.

We therefore submit that so important an enterprise ought certainly to be carried out so that the people who bear the cost should also be the principal beneficiaries, and we look to the Senate of the United States to see that the isthmian canal shall even yet be built by the Nicaragua and not the Panama route.

EDW. BERWICK,
Chairman Nicaragua Canal Committee.
B. N. ROWLEY.
EDWARD F. ADAMS.

MR. BERWICK. I move the adoption of the report, and move also, in that connection, that if the resolution be adopted, the Secretary of the convention be authorized to forward, to-night, a copy of the resolution to President Roosevelt and the Pacific Coast Senators.

PRESIDENT COOPER. I take issue with the resolution and will be compelled to vote "no," for various reasons which it is not necessary for me to express at this time.

MR. NAFTZGER. I move to strike out, in that resolution, everything after the first paragraph.

Motion carried.

The resolution as amended carried.

A recess until 1:30 P. M. was then taken.

AFTERNOON SESSION—SECOND DAY.

WEDNESDAY, December 3, 1902.

The convention was called to order promptly at 1:30 o'clock. President Cooper in the chair.

President Cooper announced the following Committee on Labor Question: H. P. Stabler, Yuba City; T. H. Ramsay, Red Bluff; G. H. Cutter, Sacramento; Robert Hector, Newcastle; Frank B. McKivett, Vacaville; A. B. Humphrey, Mayhews, Sacramento County; Frank H. Swett, Martinez; George C. Roeding, Fresno; E. W. Woolsey, Fulton, Sonoma County; B. N. Rowley, 320 Sansome Street, San Francisco; J. F. McIntyre, Ventura; Thomas Jacob, Visalia; Frank Wiggins, Los Angeles; G. H. Hecke, Woodland; B. E. Hutchinson, Fowler, Fresno County.

FREIGHT RATES.

BY A. H. NAFTZGER, OF RIVERSIDE.

One of the first requirements of civilization is ample and expeditious transportation. The surplus products of one community must be carried to another in need of them, and, in turn, the first community must draw from elsewhere such supplies as it does not produce. There was a time when the race could and did live a simple life, each community practically independent and living within itself. That time is past. The man born into the present must live in the present, and an ample and swift interchange of commodities is essential to his welfare. What he can not get in his own locality he must seek elsewhere. It may safely be said that the true basis of commercial growth and prosperity is the freight rate. This determines, to a very great extent, whether any given industry may live in a given locality, and therefore whether life itself may be tolerable in a given place. The questions of where factories shall be established, where fields shall be planted, and where cities shall be builded are all determined by the sufficiency of transportation and its cost. The great problems of commercial progress hinge upon the free interchange of commodities, and therefore upon freight schedules.

Few people realize how heavily the freight charge bears upon all industries, and upon almost all individuals. We read the tariff sheets, and glance at the totals of transportation charges, but usually think they chiefly affect other people. The truth is, that either directly or incidentally, usually the first, the freight rate affects all of us in all of our operations, unless we live a very crude life. The price of the clothes we wear and the food we eat is made up of three factors: cost of production, cost of handling, and the freight rate.

The advance statement of the Interstate Commerce Commission shows the freight earnings of the railroads of the country, for the year ending June 30th last, to have been nearly thirteen hundred million dollars. This nearly incomprehensible total does not include the vast sums paid by our people for local and steamship transportation not falling under the jurisdiction of the Interstate Commerce Commission. How much of this the people of this Coast pay I can not say, but, situated as we are, our proportion of the whole is very great, and the effect upon our industries determinative as to whether they may exist at all.

We are on the rim of the continent, removed from the centers of population, where our products must find consumers. There are high mountain ranges and long stretches of desert to be crossed, where there is practically no local traffic to compensate the carriers. Wages are uniformly higher than in other portions of the country, and consequently railway operating expenses are greater. The lines of railroad operating on this Coast are over-capitalized, and it is expected that the earnings will pay a profit upon this heavy capitalization. This applies with equal truth to most lines of the whole country. The total capitalization of the roads of the United States amounts to nearly twelve billions of dollars, or about one fifth of the whole property valuation of the country. This is a capitalization of over sixty-one thousand dollars per mile on all the roads—so the freight and passenger rates are expected to pay interest on one fifth of all the wealth of the country.

It is true that water competition has its influence upon this transportation, but certain classes of our products are not materially affected by this class of competition, as they can not be so transported. This applies particularly to our perishable fruits. It becomes a question, therefore, of serious import, whether we can pay the freight rate, and live. This is made the more serious because many other sections of the Republic are competing with us in the production of fruits. Ever since railroads were constructed across this continent, bitter complaint has been made that the basis for the freight rate is "all the traffic will bear." It is argued that the true basis is the cost of construction and operating the railroad, but the history of transportation shows that this has never been taken as the basis, the rule, as Wellington states it, being: "That the sale of transportation, like the sale of any other commodity, is governed by one universal business law of selling whatever is salable as dearly as possible, regardless of the cost of production."

From that point of view, probably, we shall have to consider the transportation problem as it affects the fruit industry of California. Until a new economic principle supplants the existing policy we shall probably have to look for relief only in showing that our commodities can not bear existing tariffs. There are some hopeful signs, as for instance a rate of seventy-five cents per one hundred pounds to the Missouri River has been made on apples from this Coast, when it was perfectly apparent that they could not be moved on a higher rate. Of course, we shall not be expected to believe that this rate is not profitable to the carriers, although they will probably so claim.

While in no sense disposed to be an apologist for the carriers, we can not perhaps very much blame the people who have under their control the instrumentalities of a monopoly for using them. Human nature is probably not very different, whether engaged in operating railroads or conducting fruit ranches, or in any other line of business. It may not be complimentary, but it is probably true that we are all monopolists according to our opportunities. The wise thing to do is not to waste our time abusing people who take advantage of their opportunities to exercise the functions of monopolists, but to so shape our institutions as to make it impossible for anybody to exercise these functions. As I have said before to this convention, railroads exist by reason of their having borrowed from the public, for the time being, certain rights which belong to the people; but until such time as these governmental rights are exercised by and for the people, instead of having been loaned to corporations, we must deal with the problem as we find it. It is true that, in many ways, the conditions have not improved with the increase of railroads, and with the vast increase of our products.

The freight rates on many of our California fruits, perhaps on most of them, are substantially the same as they were when the business was extremely small, but the facilities have been increased, and the service for the most part has been improved. There are exceptions, of course, that are extremely aggravating and expensive. Great demands have been made upon the transportation lines, especially in the carrying of our perishable fruits, and the equipment for the purpose has been greatly improved, so that we have the very best modern cars in which to transport our fruits to far-away markets. The charges for the use of these cars have been reduced by somewhat lowered refrigeration tariffs. It is true that, in some cases, this reduction has been more than offset by a discontinuance of a rebate system. It is but fair that we should recognize the real facts, and give credit to the common carriers for such betterments of the conditions as have actually been made.

It is also fair to look at the other side of this question; in doing which I venture to say that the existence of the private carline controlling the cars and the means of refrigeration has been, and is to-day, one of the heaviest burdens upon the fruit industry of California. It has laid millions of tribute upon the fruit shipments, a very large proportion of which was excessive and iniquitous. It was established and perpetuated in a system of discrimination, bribery, and favoritism. The railroads and the carlines were *particeps criminis* in this unjust system, and in many cases the shippers have been made so in an effort at self-protection. Ever since these private carlines were established, some shippers have been favored by special rates or rebates in some form. No other proof than this is needed that the published refrigeration rates are excessive, because we will not be expected to believe that the carlines would solicit the business at a loss. But we have at our door the conclusive proof that this private carline system is an evil.

Within the last few days, I have been informed by a successful fruit-shipper of Oregon, a man who has been engaged in the business there for years, that all the railroads operating out of that State to the eastward supply modern refrigerator cars, equal to the best in the California service, without any charge whatever for the use of the cars, and the only charge for refrigeration is the initial icing, amounting to about $15 per car, or the shipper may do his own icing at the point of shipment, and thereafter the railroad will, and does, keep the car thoroughly iced to destination without any further charge. The freight rates from Oregon to Eastern points is the same as from California to the same points. My informant, a gentleman of high character, tells me that the service supplied by these lines operating out of Oregon is in every way first-class. It is not improper to say that recently a reduction has been made in the refrigeration tariff as applying to citrus fruit shipments, but it required the most insistent attitude of the Southern

California Fruit Exchange, controlling about one half of the citrus fruits of the State, to prevent this reduction being made in the shape of rebates instead of an open tariff available to all. I do not pretend to say that the Southern California Fruit Exchange has never availed itself of any rebate privileges or opportunities, but I do say it has never done so of choice, and it has always stood, and does to-day stand, as opposed to these clandestine practices, believing that one rate, open to all shippers, is the only just and equitable rate. Rebates are usually for the benefit of the speculator, very seldom for the grower. It is my belief that the transportation of our fruits can never be put upon a proper footing, and fair and just rates obtained, until the private car system is entirely eliminated. This should be done as well in the interest of the railways themselves, as in that of the shippers. It is notorious that ever since the establishment of the private carlines in the California business, owners of at least some of the cars have been fruit shippers as well, and as such, in the very nature of things, have had an advantage over their competitors and have been able to a certain extent to dictate terms to the carriers not obtainable by other shippers. The case is well stated in a recent article by Mr. J. W. Midgeley, in which he says:

"In addition to the current tariffs, the contemplation of which must be humiliating, and should command the attention of those who are responsible for the properties, is the incubus of private cars owned by shippers, who, not content with naming the rates they will allow for the transportation of their freight, also extort for the vehicles they own mileages so excessive that their consideration should impel those who have the ability (and a comparative few possess it) to eradicate in a manner quite feasible an evil which from a small beginning has grown until it has become the most grievous burden that afflicts American railways."

The fruit growers and shippers of California should, in my judgment, set their faces steadily to the accomplishment of this purpose—the elimination of the private car from the California fruit traffic.

When the private car shall have been removed, the atmosphere will be cleared, and we can take up the rate question free from prejudice or interference from outside influences.

Since, as I have stated, the freight schedule is not based upon the cost of production, it would be useless to discuss in this paper the cost question, or to weary you with figures. However, one or two points that have to do with figures are frequently urged by the railroad people when the rate question is under consideration. One is the claim that California fruits are carried to Eastern markets at a rate per ton per mile less than the average rate on all the traffic of the country. This contention is not supported by the facts, as shown by the report of the

Interstate Commerce Commission. The average rate on all the freight of every class on all the roads of the country is less than three fourths of a cent per ton per mile. Take the rate on California fruit shipments from Sacramento or Los Angeles to Chicago, as an average; the $1.25 per hundredweight rate now prevailing is slightly over one and one tenth cents per ton per mile, an increase of fifty-four per cent above the average rate. It is also contended by the carriers that our fruits must be transported long distances over high mountain ranges and barren deserts affording no local traffic, and that these shipments must be carried fast time. Unfortunately, a very large proportion of these shipments are notoriously not given fast time. It is my understanding that the fresh fruit shippers are willing, for the time being, to waive objections to the existing freight rate if they can have schedule time. I believe concerted and aggressive action upon the part of the shippers would remedy existing conditions as to time. This paper is, however, not the proper place to suggest the remedy. These claims can not be denied; but in addition to the higher rate paid per mile is the fact of a very long haul and the further fact that the carriers are not called upon to load or unload these shipments—no handling whatever. The average rates above cited cover, as stated, all classes of freight, including a vast number of short hauls, in less than car lots, where the element of clerk hire and handling is very great.

Our problem, as I see it, is to show by actual data that the California fruit industry can not live and prosper under existing freight tariffs. Ours is not a quarrel with individuals. It is not because we have ill feeling against men that we object to the rates on the railroads under their control. We do, however, recognize, as I have hinted, that the same infirmities exist in railroad managers as in most other people.

If we leave these gentlemen undisturbed to say what are reasonable rates, and with power to enforce them, we may expect them to render judgment in their own favor.

The fruit shipments from California pay enormous tribute to the transportation companies; so great, in fact, that other lines are studying the situation and reaching out to secure a portion of the traffic. The rapid increase of the product from our orchards will have a tendency to depress prices, and will also require increased facilities for transportation. We should therefore encourage the entrance of new lines into the State, as well as seek reduced rates: The construction of the isthmian canal is certain to materially reduce the rates on some of our products—possibly on nearly all of them. There can be no desire upon the part of thoughtful honest men that rates should be less than profitable to the carriers; but, on the other hand, unless the growing of fruit is fairly profitable to the orchardist, the business will perish, and one of the commodities most profitable to the carriers will disappear.

We should accumulate and preserve, for instant and constant use, facts and figures showing the need of lower rates, and, without passion or prejudice, put these facts before the officers and directors of the great corporations transporting our fruits, so that, as wise, conservative business men, we may together consider these important matters, and try as nearly as possible to obliterate the difference of opinion in regard to freight rates. The work of education must go forward with our own people, that they may be thoroughly aroused to the needs of the industry and assert their rights in every reasonable way, without attempting to inaugurate destructive policies. Much can be accomplished by patient and persistent effort, until at last, out of the crystallization of public sentiment, and the calm conclusions of public conscience, shall come the right thing, the public ownership of public utilities.

TRANSPORTATION.

BY FRANK E. KELLOGG, OF GOLETA.

In this great land of ours, with its wide diversity of climate and soil, enabling us to produce almost anything that can be grown anywhere on the earth, interstate and local commerce is becoming a question of supreme importance. And as the railroads are our chief means of local and interstate transportation, the railroad problem has become one of the leading questions of our day.

The absolute necessity of railroads is too apparent to admit of any discussion. But how to regulate freights and fares to prevent the exploitation of the producer by the transportation companies is a question which is loudly demanding a solution.

If the farmer produces a low-priced crop, like hay or grain, requiring but little agricultural skill, and on which the profits are usually small, the transportation rates are comparatively low—just simply high enough to consume the small margin of profit between the cost of production and the selling price, leaving the farmer barely enough to meet the cost of living.

If, by superior intelligence and skill, he produces a high-priced crop, like oranges, raisins, or nuts, he finds that the transportation charges are correspondingly higher, so that the margin of profit between the cost of production and the market price will be absorbed by the public carrier, leaving him only enough of the profits to meet the actual cost of living.

He also finds the freight charges rise and fall in accordance with the fluctuations in the price of his products.

In 1885, the Northern Pacific Railroad Company advertised for sale the wheat lands along its line in the State of Washington. Farmers examined the land, and finding it admirably adapted to the raising of wheat, and also finding that the charge for freight to the city of St. Paul was only forty cents a hundred, saw that there would be a reasonable margin of profit, and so they purchased the land of the railroad and went into the wheat business. At first, they were highly pleased with the results, and congratulated themselves on their sound judgment and good fortune.

But in 1888, something occurred which made wheat-raising in that section unprofitable. Had they exhausted the fertility of the soil, or was there a drought? By no means. The thing that happened was simply this: The railroad increased the charge for freight up to a point where all the profits of the industry fell to them. The farmers appealed to the Interstate Commerce Commission, but that body sustained the action of the railroad.

In the report of the Interstate Commerce Commission for 1900, page 41, you will find an account of the action of the merchants of Kearney, Nebraska, against the Burlington & Missouri River Railroad, et al., for charging a rate on sugar from San Francisco to Kearney of 77 cents per hundred, while the rate through Kearney and on to Omaha was only 50 cents per hundred. The strange part of it is, that while the Commission decided that 77 cents per hundred was too great a discrimination, a rate of 65 cents per hundred would be justifiable. In another instance, the Commission decided that it is lawful for railway managers to carry products for persons living at great terminals for one half the rates levied upon those living at intermediate stations.

"But," says Mr. Cowles (page 108, General Freight and Passenger Post), "the height of absurdity in this business was reached, when the majority of the Supreme Court of the United States decided that it was lawful for American railway managers to charge three or four times as much for the transportation of goods from American workshops to their American customers as was charged for the transportation of similar goods from Europe to the same customers."

How does it happen that the railroads are so powerful that they can thus ride rough-shod over the common rules of equity and justice, and how does it happen that the laws support them in it? A little investigation will show that it has come about in a very natural way. When railroads made their advent in our country, on account of their rapid transit and convenience, they were considered to be a panacea for all industrial and commercial ills. The minds of all classes were so prepossessed in their favor, that the common citizen who dared to suggest any safeguards for the future was denounced as an enemy to progress, and the legislator who would have dared to delay the granting of charters for the sake of perfecting them, or safeguarding them against possible abuses, would soon have found himself without a constituency. Hence, the railroad companies, as a rule, were permitted to prepare their own charters, which almost invariably received legislative sanction. Almost unlimited inducements were held out and every sacrifice made by communities and by the nation to encourage the building of railroads. The first transcontinental railroad not only received a free right of way and grants of government land of incalculable value, but, in addition thereto, the United States issued to the companies subsidy bonds sufficient to build and equip the road. On the completion of the road, the promoters, who at the start were men of small means, became millionaires, for in reality the Government built and equipped the road, and made them a present of it, under a charter which practically they themselves framed.

The possibility of railroad abuses under these liberal charters was not thought of, for it was considered to be a fundamental principle of economics that competition would correctly regulate the price of freights and fares, just as it had done with the stage coach and freight wagon. If any one suggested that they might be exorbitant in their charges, he was met with the reply that such a course would cause the construction of rival roads, which would speedily regulate prices on the competitive principle. Such a thing as the combination of the roads was never dreamed of.

Thus we see how easy it has been for the railroads not only to be built, but also to gain the vast power which they possess. As to the present magnitude of the railroad business in the United States, the Interstate Commerce Commission's report for the year ending June 30, 1901, informs us that there are now 2,023 railway corporations in the United States. Their combined mileage exceeds 193,000 miles (more than seven times the distance around the world), and their capitalization reaches the astonishing sum of nearly $11,500,000,000. The number of employés is a little more than 1,000,000. For the year above named, their combined income from operation, or the amount of earnings remaining after deducting operating expenses, generally designated as net earnings (p. 56), exceeded $525,600,000.

As to the power which they enjoy, under their charters, so largely framed by themselves, it is almost as absolute in our industrial world as is that of the Czar of Russia in his empire. In spite of legislative enactments for the curtailment of their power, and notwithstanding the authority with which the Interstate Commerce Commission has been vested, and the use which it has tried to make of that authority since the organization of the commission in 1887, still the railroads are practically the undisputed masters of trade, conferring wealth on their favorites, both men and cities, and bankrupting whomsoever they please. By almost universal combination, they have made the law of competition inoperative, and have fixed freights and fares, whose arbitrary and extortionate rates are only limited by human greed, modified by the fear of competition at interior points by the primitive stage coach and freight wagon, and at terminal points by water transportation. To make their extortions less apparent to the public, the railroad corporations have inflated their capital stock to perhaps double its real value, so that the percentage of profit will appear to be within the limits of reason.

It is principally by reason of extortionate freight charges that so much distress has prevailed among farmers of recent years, and that such a vast number of farms are under mortgage to-day. And it is not improbable that unless there is speedy relief in this matter, the railroads will become the actual owners of the farms, just as they have already become the possessors of the principal oil and coal fields.

The great question is, "How shall we prevent this, and by what means will relief be obtained?"

Entrenched as they are behind their liberal charters, there seems to be no legal method by which they can be shorn of their extortionate prerogatives and put under proper governmental restrictions.

And all experience has proven them to be as deaf to the appeals of the people for justice as was King George in the days of the American Revolution. The only means by which our ancestors could escape from the tyranny of the British crown was to establish a government of their own, and the only way of our escape from the commercial tyranny of the transportation companies, "under which we have so long and so patiently labored," is to forever throw off their yoke by building railroads of our own. Railroads *of* the people, *by* the people, and *for* the people is the only medium through which permanent relief can ever come.

If municipalities have found the ownership of street-car lines of immense value to city governments, why would not our Government find the ownership of railroads of corresponding value to it.

If fifty-four of the other governments of the world, including provinces, kingdoms, empires, and republics, have found government ownership of railroads of great value to them, why would not the United States?

Time will only permit me to give a few of the reasons in favor of government ownership. The principal reason is, that freight and passenger rates would be greatly reduced.

While the tendency of private corporations is to render the minimum of service for the maximum of pay, as they are in business solely for profit, the tendency of government control is to render the maximum of service for the minimum of pay, and, in the very nature of things, the latter will be cheaper than the former. To illustrate this truth, compare the telegraph system with our postoffice department. The one, under private ownership, rolls up its profits by the millions; the other, under government control, is conducted wholly in the interests of the people and practically at cost.

According to the annual report of the President of the Boston Electric Elevated Railway Company, as published in the March Arena, p. 325, the net earnings of the company for the year 1901 were almost three and one half millions of dollars. Does any one doubt that the city could have managed the system just as efficiently as the corporation, and could either have applied that large sum of money to general municipal expenses, thus relieving the people of that much in the way of taxation, or the city could have given the people a cheaper fare?

Likewise, does any one doubt that the government of the United States could have managed the railroads in 1900 as efficiently as did the corporations? If so, the government, by running the roads at cost as it does the postoffice, could have made a reduction in freights and fares aggregating, as shown by the Interstate Commerce Commission report, over $525,600,000.

Besides, there are vast expenditures under private management that would disappear under public control.

Ex-Governor Laribee of Iowa, in his masterly book entitled "The Railroad Question," quotes largely from an article by C. Wood Davis, published in the Arena. Mr. Laribee, in referring to Mr. Davis, says that he was formerly general freight and passenger agent of one of the leading roads east from Chicago, and that "he is one of the best informed and clearest-headed writers on the railroad question."

Mr. Davis, in the article referred to, makes an itemized statement of the estimated net annual saving to the public, which would result from government control, as follows:

From consolidation of depots and staffs	$20,000,000
From exclusive use of shortest routes	25,000,000
In attorneys' fees and legal expenses	12,000,000
From the abrogation of the pass evil	30,000,000
From the abrogation of the commission evil	20,000,000
By dispensing with high-priced managers and staffs	4,000,000
By disbanding traffic associations	4,000,000
By dispensing with presidents, etc.	25,000,000
By abolishing all but local offices, solicitors, etc.	15,000,000
Of five sevenths of the advertising account	5,000,000
Making a total saving of	$160,000,000

Add this sum to the net earnings of the roads already given, and which might be saved to the public if the roads were run at cost, as the postoffice department is, and you have the astonishing sum of $685,600,000.

But the actual saving to the public under government ownership would doubtless exceed this estimate, for it is a well-known fact that the lower freight and passenger charges become, the greater the volume of the business.

A railroad system is a great machine, in which the wheels, instead of whirling on a stationary spindle, roll along on an iron track. It requires just so many men to operate this gigantic machine, and the expenses are about the same, whether it runs empty or loaded. Hence, the larger the load the cheaper the owners can afford to carry passengers and freight.

The present popular Mayor of Cleveland, the Hon. Tom L. Johnson, says, as reported in the Literary Digest of recent date, that he demonstrated, while operating the street railways of Detroit, that as much money can be made out of three-cent as out of five-cent fares, for a corresponding increase in traffic follows any reduction in rates.

If our railroads were nationalized and the charges for freight and fares should be based, not on the value of the service, but on the cost of it, as advocated by the Hon. J. L. Cowles in his powerful plea for "A General Freight and Passenger Post" (a masterly book of some three hundred pages), I am persuaded that the time would not be far in the future when the factor of distance would be eliminated, and the rates, as Mr. Cowles claims, would be uniformly the same for all points far and near, and the cheapness of the rate would be simply marvelous.

The principle involved in a uniform fare and freight rate is illustrated by the government telegraph system of Great Britain, where, for only twelve cents, you can send a dispatch anywhere, from one mile up to one thousand miles, if need be.

It is perhaps more clearly set forth in our postal service, where for two cents you can send a letter many thousands of miles as cheaply as you can send it only one mile.

But perhaps the best exemplification of the principle involved can be found in the street-car systems of our cities where the uniform fare is five cents. The conductor never asks you whether you are going to travel one block or one hundred blocks. You pay your nickel with the assurance that it will carry you to the end of the line, if need be. Nor does the size of the city have any tendency to increase the fare. If it should be one mile or one hundred miles across, the five-cent rate would prevail just the same. Did you ever study out the reason why this is the case?

It is simply because the average distance traveled by the passengers is very short. One set of passengers is constantly getting off and a new set is constantly taking their places, so that the seats in the cars are paid for over and over again as the cars go back and forth, until the aggregate amount received for the seats far exceeds the cost of running the cars. Now, precisely the same principle would apply to country railroads.

In fact, it has, in at least one case, been already applied. For the past four years, according to Mr. Cowles, the Blue Island line of the Chicago and Northern Pacific road, which is twenty-seven miles in length, has had a uniform five-cent fare, and its profits are much greater than under its old three cents a mile fare, owing to the vast increase in travel.

Now, the price of a uniform fare for all distances would depend on the average distance that passengers would travel, and the density of the population, which would determine how many of the seats would be continuously occupied. That is to say, it depends on how many times per day, or per trip, the cars would be emptied and the seats resold.

At the present time, the average distance traveled by an American railroad passenger is twenty-three miles, and the average fare paid, according to the official report of the Interstate Commerce Commission for 1896, is 52 cents. Hence, if the same number of people should continue to travel, and the average distance should remain the same, the railroads would take in just as much money at a uniform 52-cent fare as they do now.

I am not prepared to give my opinion on what the uniform fare might become under government control, but will refer you entirely to Mr. Cowles, a perusal of whose book will at least convince you that his researches have been very profound. And his calculations have appeared so reasonable that no less a personage than government statistician Carrol D. Wright has indorsed them, and Congressman N. D. Sperry, of Connecticut, has introduced a bill in the House of Representatives asking for the postal control of all the railroads of the United States, and recommending the rates established by Mr. Cowles.

Now, please bear in mind that these are uniform rates, on the postal principle, whether for one mile or from ocean to ocean.

The rates suggested are so low as to be simply astounding. Here they are:

By fast post, palace cars	$5 00
By fast post, ordinary cars	1 00
By express post, palace cars	1 00
By express post, ordinary cars	25
By local post, palace cars	25
By local post, ordinary cars	05

Don't you think that on the last named rate we might, by clubbing together, send a man East occasionally to look after our walnut and lemon interests?

Now, precisely the same principle applies to freight, the uniform rate to be fixed depending on the average distance of transportation and the amount of freight carried.

In the neighborhood of our great cities uniform rates have been charged on the transportation of milk for many years, the charge being exactly the same for one mile as it is for forty miles.

After citing various instances of present cheap transportation, and showing that the present average charge is one dollar per ton and the average haul is one hundred and twenty-six miles, and basing his calculations on the reports of the Interstate Commerce Commission, and conducting them in a manner in every way similar to the way in which he established the proposed passenger rate, Mr. Cowles made his estimates of what the uniform freight charges should be, and his recommendations were also embodied in the House bill above referred to.

The estimates are no less surprising in the latter case than in the former. They are as follows:

On local freight in box cars, in less than carload lots, $1 per ton.
On local freight in open cars, in less than carload lots, 50 cents per ton.
On local freight in standard box cars, $6 per haul for entire car.
On local freight in standard open cars, $5 per haul for entire car.

By a simple calculation you will find that the first two rates named, if we call twenty tons a carload, would be 30 and 25 cents, respectively, per ton.

While you may not consent that the present average density of population would justify the above-named rates, yet the investigation will convince you that, under government control, tremendous reductions could be made on our present rates.

The benefits that would accrue from uniform rates that would even approximate these figures, would simply be incalculable, for they would tend to equalize not only agricultural, but all economic opportunities, and all the lagging wheels of industry would respond to the powerful impulse.

Also, under government control, strikes, which so seriously interfere with transportation, would entirely cease.

Also, the government, with its prime motive to run the roads not for profit, but for the benefit of the people, would, by the employment of more men, and the laying of double tracks, greatly diminish the number of accidents, and consequent loss of property and life. For the year ending June 30, 1900, as reported by the Interstate Commerce Commission, there were 58,185 persons injured in railroad accidents, of whom 7,865 were killed. In the past thirteen years, including the year 1900, 86,277 persons were killed in railroad accidents, an average of 6,600 per year. I am persuaded that under present management the American railroads are destroying more lives than all the cyclones and earthquakes and tidal waves of the world combined.

Let us now consider briefly some of the leading objections urged against government ownership.

The most common objection is, that government ownership would put the railroads in politics, and, by increasing party patronage, enlarge the field of political corruption.

Did it ever occur to you that the railroads are in politics now as much as they ever can be? But since the introduction of the secret ballot, their political power is surely doomed. However, aside from the purifying influence of the secret ballot, there are other ways by which the patronage capable of abuse by any party could be entirely eliminated.

For example, if all persons elected or appointed to any railroad position were deprived of their vote while thus employed, as is the case with our soldiers and sailors while in actual service, then they would be as incapable of corrupting our politics as are our soldier boys over yonder in the Philippines.

Also, if civil service were entirely separated from politics, and put wholly on a business basis, as it ought to be, and employés were appointed solely on their fitness for the position to be occupied; and if they were to hold their positions for life, subject only to good behavior, as is the case with the judges in the United States courts, then the railroad employés would entirely cease to be a factor in the matter of political corruption.

As a matter of experience, public ownership of monoplies has, wherever tried, exerted a tremendous influence in favor of civil service reform. For there can no other way be found so effectual in compelling the best men to take an interest in this reform as the putting of important business interests into the hands of the government.

In proof of this statement, we need only point to those great cities that have advanced most in the municipal ownership and control of natural monopolies, and we find that they have been transformed from the vilest conditions of political corruption into the best governed cities of the world. The cause of political corruption is private interest as opposed to the public welfare, and under public ownership all private interest in the railroads would cease, and both the temptation and the opportunity for corruption would be removed. Have you ever heard of a public road, a public school, or a postoffice lobby or corruption fund, and is there any evidence that the public ownership of these great institutions, of which we are so justly proud, is giving any cause for alarm? Neither would public ownership of railroads be a menace to our liberties or welfare.

Do you tell me that government ownership may operate satisfactorily in a monarchy, but would be impracticable in our country?

If this is true, then American democracy is a dismal failure, and we are not only inferior to the monarchies of the old world, but are more incompetent than other republics which have already demonstrated their ability to manage their railroads.

Justly we pride ourselves on our inventive genius, tell of the great institutions we have reared in the western world, point with pride to our military achievements on land and sea, and to-day, with the flush of recent victories still on our cheeks, we boast that we are the greatest nation on the face of the earth, and yet you claim that we are not competent to run our railroads. Away with such nonsense! We have already demonstrated our ability to run them, even under the most difficult conditions, for time and again, when the companies have gotten into inextricable difficulties on account of their incompetency, the Government, by means of a receiver, has temporarily taken full control, and when the snarl was untangled has handed the roads over again to the companies.

Do you tell me that government officials could not be trusted to handle the vast revenues that would flow from such a gigantic business?

Let me ask you whether you would rather take your chances with unrestricted officials, who appoint themselves, with unlimited and unconditional tenures of office, and who give no bonds for the faithful performance of their duties, and who pocket all the profits, or would you rather take your chances with men of your own selection, whose terms of office are either limited or dependent on good behavior or competency, and who must give heavy bonds for the faithful performance of their duties, and who must turn over the profits to you either in the form of reduced taxation or lower rates?

Do you tell me that the sole province of government is to administer justice, and that it has no right to embark in business enterprises? That doctrine was once considered sound philosophy. So also was the doctrine of the divine right and consequent infallibility of kings.

In theology and science, and in every department of human intelligence, the world is moving on to new and higher conceptions of truth, and the greatest political discovery of the modern world is that all those things which must be used by the people in common should be owned and operated by them in common, while those things that are used by the individual in his private capacity should be owned and operated by the inividual. Long ago, the private letter-carrier gave way to the public postoffice, the toll road yielded to the public highway, and the private school was left far in the rear by our system of public education.

Two thousand American cities own and operate their own water systems, and they are now reaching out after the electric lighting and street-car service, all in accord with the new political philosophy.

Now, if there is anything which must be used by the people in common, then the railroad is such a thing. It is absolutely indispensable to our civilization. Therefore, it ought to be owned and operated by the people collectively, that is, by the government.

Do you ask me how we are to go about the securing of government ownership? It can only be done by intelligent agitation and co-operative effort. When public sentiment in favor of it becomes strong enough, then we will get it.

It was public sentiment in a non-partisan way that gave us the Australian ballot system, that has interested the United States Congress in the irrigation of western land, and that has given us our forest reserves.

And if we but agitate and wisely educate public sentiment, the time is near at hand when no political party will dare to omit from its platform a public ownership of railroads plank. I am persuaded that if the matter were to be decided by a referendum vote of the people it would be carried by a popular election now.

The political doctors are very close observers of the public pulse, and whenever public sentiment beats strong enough, you can depend on them, every time, to act in the interest of the people, for what they want is votes.

Are you staggered at the thought of the tremendous cost of a railroad system to the government? It would be less than you think.

Ex-Governor Laribee, of Iowa, in his book "The Railroad Question," states, on page 187, that $25,000 per mile would be a liberal estimate of the cost of the present American railroads. On the preceding page, he proves by the testimony of the Union Pacific Company that they constructed one line of road at a cost of less than $7,300 per mile; and he states that, in recent years, tens of thousands of miles of railroads have been built at a cost not exceeding $10,000 per mile.

Let us suppose that the average cost of road building by present methods would be $20,000 per mile. At this rate, a transcontinental road would cost only $60,000,000, which is less than one half the cost of the Panama Canal, and less than one third the cost of the Nicaragua Canal, as estimated by the Isthmian Canal Commissioners, appointed by the United States government; and, in my opinion, a transcontinental government railroad would be ten times as profitable to the people as an isthmian canal.

Our estimated annual saving to the people of the United States of $685,600,000, that would result from government ownership and control, would more than build ten railroads from the Atlantic to the Pacific Ocean.

From time to time various transcontinental lines could be built, and laterals gradually extended, until a complete system was installed. It need not all be done in one decade, or by one generation even, nor need it all be paid for by the present generation. However, it would be but a small matter for the government to pay for the roads as they are constructed and leave no bonded debt. Do you ask how this could be done? If no better means could be devised, then the little revenue stamp which furnished the untold millions for driving the Spanish from the Western world and of subjugating the Philippines, could safely be relied on to do the work.

CALIFORNIA DECIDUOUS FRUIT INDUSTRY.

BY A. R. SPRAGUE, OF SACRAMENTO.

The importance of this industry to California should command the interest of all. There are areas in the Union that produce a better quality of wheat and even a larger product per acre; other portions of the country, too, are extremely well adapted to livestock production; others to mineral productions; but I think we may fairly claim that no where else can fruit in such variety and of such high quality be produced with such fair average success year by year. If this be true, the development of fruit culture should be the one dominant aim in California. Again, this class of production necessarily brings with it dense population, which leads to a higher plane of living, so that for social as well as industrial considerations, it is fair to indulge the hope that in some way fruit products in California may be safely extended toward their natural limit. At present the condition of the industry is such that there is no thought of extending it, but everywhere there is felt, rather, the necessity of restricting the output. Any natural extension of the industry would require a steady demand for the product at moderately good prices; with this assured, the rest will follow.

Inquiry as to how far present conditions conform to the above requirements is hardly necessary, and time forbids a full statement of average net prices received by growers for different varieties of deciduous fruits for a series of years; but I am talking to a body of men to whom such a tabular statement would be superfluous, for all well know that through recent years the markets have been most unsatisfactory, except during some year of unusually small crops here or in the East.

Another factor that can be considered in this connection is the tremendous extension of orchards in the East and South, which threatens a competition which will still further restrict our output. Certainly, if all causes now unfavorably affecting the industry are to remain in full force, he must be an optimist, indeed, who would dare to increase his deciduous orchard holdings in California.

Granting, then, the unsatisfactory condition of the industry at present, we may set out to find its cause; as is usual in such cases, no one influence produces the result.

The consumption of California dried fruit has not increased with the increase of population. Among the many reasons which may be assigned for this I suggest the following as the most influential:

First, the excessive prices demanded by retailers. While in an Eastern city last spring I took occasion to visit several of the larger retail stores in which California dried fruit was offered for sale, and I found that they were demanding 25 cents per pound for dried apricots and 20 cents per pound for dried peaches, of no better quality than the fair average of choice fruit produced in the Sacramento Valley. This fruit could not have cost them more than 8 to 10 cents per pound delivered, and a fair profit, say of twenty-five per cent, would have enabled them to sell it at not to exceed 10 to 15 cents per pound. With such a price it is safe to say the demand for it would have been two or three times as great as it was. With the prohibitive prices which they demanded, only those families having money to spend somewhat freely could afford the luxury of California dried fruit.

The second prominent reason for the unsatisfactory demand for our dried fruit, I think it must be admitted, is the poor quality of much of the fruit marketed. This poor quality is owing in part to poor orchards, the result of a wrong location, bad cultivation, or poor pruning or thinning.

Another cause of unpalatable dried fruit is the result of wrong or excessive processing or bleaching. Most growers are quite familiar with the method used to bleach fruit. Much of the fruit arriving at the cutting table is either too ripe or too green. It is all cut, however, because it costs a little less to do so than to use careful selection to determine what fruit is ready to cut for drying; and because the owner places his confidence in the sulphur bleach, trusting that it will remove all blemishes, making all of uniform color and producing a fine looking and salable product for the market.

An analysis of this bleaching process develops the fact that the bleach is not used only to arrest the oxidation at the surface of the fruit, but the fruit is kept in the sulphur fumes until the tissue is all broken down, and the cup left by the pit is filled with juice.

In this way it is found that in the more moist climates of the State fruit can be dried in reasonably quick time, when without such bleaching process it would be almost impossible to cure it.

This would indeed be quite satisfactory if the fruit was not intended for eating, but were to be used for decorative purposes merely.

Now I do not stand here to advocate the abandonment of the use of sulphur fumes in bleaching fruit. It is clear to my mind that if sulphur is used with care and to no greater extent than is necessary to produce a fairly even and well-colored dried fruit in a hot, dry climate, there would be but little objection to its use. In such cases a small amount of sulphur used is sufficient to arrest the process of oxidation or discoloration of the freshly-cut surfaces of the fruit, and this is all that is necessary to use in districts that are adapted to the production of a fine quality of dried fruit. Only the surface of the fruit would in such cases be penetrated, and this would wash off without impairing the flavor of it. I think such fruit thus so lightly sulphured would be objected to by no one, not even by the most critical of German consumers. Of course this would make it necessary to abandon the production of dried fruit in such portions of the State as are too damp to cure it by any such scanty use of sulphur bleaching; but such restriction of production would operate most favorably to the industry of the State, and in those particular regions the fine fruit produced, which is now dried, could then be canned, to the advantage of all concerned.

It may be urged that the larger part of the dried fruit now produced is not subjected to excessive sulphur bleaching; but it must be admitted that a very considerable portion is thus spoiled for anything but exhibition purposes, and this part clogs the market and discredits the whole.

The instructions usually given by the buyers to the orchardists are, "Sulphur all you can," "You can not make the fruit too light colored," "The Eastern people buy by the eye and not by the palate."

This would be all very well if the Eastern people would only continue to buy stuff which, when bought, they find that they can not eat, but, unfortunately for us, they refuse to do this, and consequently our dried fruit, which should be a prominent and most delicious dish, found on every family table, is thrust aside for canned fruit, which is about six times as expensive, and the dried fruit remains a target for the jibes of facetious editors.

But we could not safely trust even our choicest dried fruit to the present methods of packing and marketing, with no regulated control over either on the part of the grower of the fruit.

The present packages most in use are injurious to the fruit which is long exposed for sale, and are most inconvenient both for the grocer and the consumer.

The one-pound to five-pound carton is the proper package for dried fruit, for convenience, cleanliness, and the promotion of reasonable and steady prices to the consumer. It is not a sufficient objection to this to say that it has been tried and abandoned. What packages of breakfast foods would have pushed their way to general acceptance without more advertising and promotion than fruit cartons have had?

I have thus dwelt upon the needs of the dried fruit industry, because it is by far the larger part of the deciduous fruit industry; but to keep the dried fruit production within reasonable limits, it is most important that as much as possible of California fruit should be marketed fresh. This brings us to the discussion of the present condition of the fresh fruit industry.

In large measure the above-mentioned conditions tending to decrease the demand for dried fruits operate also to check the consumption of our fresh peaches, plums, and pears; namely, excessive profits demanded by the retailer, and the poor quality of much of such fruit sent East; for Tokay grapes which were sold to a certain retailer for $2 per crate in the West, he demanded $4 per crate for.

With fresh fruit, however, the poor quality of fruit when it arrives in the East is often caused by delays in transit, which of course are attended with defective icing. A car may take thirteen days to reach New York while the schedule time is nine days, and may still arrive in good condition if the delays are somewhat evenly divided along the line from Sacramento; but if a car takes three days between icing stations that are placed to re-ice cars running on a schedule of thirty-six hours, the fruit is quite sure to suffer in consequence. Such and much worse delays have been unpleasantly common during the past shipping season.

In the growing competition with eastern Oregon and Washington, and also with Southern fruit, our greater cost for freight and refrigeration is a most serious disadvantage, and some concessions must be made to the California fruit-grower if he is to successfully compete with his growing rivals.

I know of no scheme by which all difficulties can be at once eliminated, and the great deciduous fruit industry of California be placed immediately upon a constantly profitable basis; but one plan gives so bright promise of steadily growing success, that the fruit-growers of the State may enter upon it with all confidence that steadily and strongly it will move forward to accomplish the redemption of the fruit industry of California from the disabilities which now fetter it.

All questions of labor needs absolutely demand co-operative action, so that each local association may act promptly and responsibly, and so that all action may be harmonized by the central organization.

No individual effort is equal to the great tasks necessary to make safety profitable in this great fruit industry. To whom, then, may we look to accomplish it? Evidently only to those most deeply concerned in it—the men who are most deeply interested in it, the men by whose toil and sweat this great output is produced—the growers. By co-operating they can move forward irresistibly to success. No need of any one being long in doubt as to what methods should be used. But one plan of organization has never disappointed those who have supported it. I need hardly name it, for it already has shown seven years of successful operation. The fruit exchange system rests upon the same principles as does our National Government—local control of local interests, with centralized control of general or common interests.

The local association assembles the fruit in car lots and the central office or exchange takes charge of and markets the same. Representatives from the local association form and conduct the central office or exchange.

All interests are homogeneous, and hence all, while striving to best serve their own personal interests, are also best serving the interests of the whole organization, a condition impossible to any organization made up of growers and speculators.

The system is elastic and adjustable; it may be used with fresh or dried fruit or citrus products. It is the same system as that of the great Rochdale co-operation in Great Britain, which does a business of three hundred millions a year, and numbers one seventh of the population of that kingdom in its constituency. It has won continuous victories for the citrus-growers in Southern California, and has shown its perfect adaptation to the dried fruit industry in the same section.

In the north, as the California Fresh Fruit Exchange, it has demonstrated that it is the method best adapted to serve the fresh fruit industry.

It chases no rainbows, nor does it seek to control everything in sight all at once; but, moving upon safe and well-tried principles, it takes such good care of what business it has that steadily more business comes to it, and by this natural growth it gradually comes at last to a position of such commanding importance that it will achieve most of the aims desired by the California fruit-grower. At the present rate of growth the California Fresh Fruit Exchange in three years will ship five sixths of the fresh fruit of the State. Not any single organization can accomplish all which co-operation should; but if each one uses the same general system all may be joined for common ends, quite as easily as the local associations into a central exchange.

Co-operation is the influence which is working more vast industrial changes than any other in the world to-day. It has led to the consolidation of capital with a mightier control than kingly potentate ever dreamed of—making scores of captains of industry willing to sacrifice their individual business plans and preferences and be led by one man, in order that all their common interests might wage protective and aggressive warfare upon all other interests, until no business but agriculture is not availing itself of this vast new-found power.

But, greater marvel than all, it has fused into a compact whole masses of wage-workers most diverse in birth, disposition, education, and environment, making them willing to suffer, not merely the loss of personal preferences, but hunger and cold for themselves and, what is far worse, the sorest privations by their wives and children. And for what? In order that their co-operation may not fail. What was it that drew from all ranks of workmen all over the world, such generous sums from all too scanty savings for the suffering families of workmen in the anthracite coal fields?

Was it not that the right of the workmen to co-operate had been denied by one of the greatest combinations of capital in the world, with other vast interests consenting?

Was it not because they had tested and proved the advantages of co-operation in wringing from reluctant employers a fairer wage, making life better worth living?

Was it not because they had felt the abject helplessness of the individual laborer when in the presence of corporate influence so organized as to seem omnipotent, and—with its pitiless black-list—omnipresent?

These men have testified to the value of co-operation. They, too, have revealed its primary and essential law—that only as one is willing to most freely sacrifice to secure the success of all, does he truly co-operate—that only as he puts all his strength with that of his fellows can he hope to succeed; and to succeed means to him stable wages and honorable, independent toil, while to fail means to become again the abject and servile suppliant for the right to live, receiving from impersonal and hence unfeeling corporations such dole of wages as might sustain the gradually lowering scale of living.

Now, fellow growers, the individual California fruit-grower is as powerless to help himself as is the poorest wage-worker. Not a single evil afflicting the industry can he individually remove nor bestow one benefit. Acting singly he is as one possessed by a frightful nightmare, with feelings all intensified, but denied the relief of courageous action. He sees his orchard, which perchance has swallowed up the savings of years of toil and self-denial, depreciating constantly in value, as year by year it yields him a more precarious living. He knows that with every month that passes, some competing fruit area is pushing a serious competition with California fruits. He knows, too, that while he is abjectly irresolute, growers in other States are welding themselves into compact organizations to achieve and maintain their commercial superiority. He knows that if he will but avail himself of methods of co-operation of proven worth, he may regain his losses and justly profit by the advantages so lavishly bestowed by such friendly climate and generous soil. He knows, too, that many economies wholly beyond his reach as an individual are easily his if he will obey the present universal industrial law, and co-operate. He knows that reasonable and steady profits may be his if he will be true to the law of co-operation which prompts those with common interests to co-operate to achieve them. He knows that he is despised by many who profit at his cost; that he is derided for attempting business by controlling the sale of his own products; that in his own chief home market the attempt to sell his own products was met by the demand that he should disincorporate and cease to co-operate. A right now admitted for all other members of society denied to the California farmer by a combination of commission merchants! He is yet asleep, but through the dim chambers of his mind flit suggestions of opportunity and power, and his unquiet mutterings give promise of his awakening when he shall stand forth in strong, patient, and courageous action in such method of co-operation as shall enable the orange-grower, the raisin-grower, the prune, peach, and apricot growers, and the fresh fruit men as well, to act as one force to secure every common good, while each organization shall manage its own particular business in its own way.

To this end let us invoke every energy of California society, for not only the grower, but the merchant, the banker, and the professional man should be working together to save this fundamental industry from total disaster.

REMARKS ON DISTRIBUTION, ETC.

C. D. HARVEY. My time is occupied in the interests of our producing classes. My expenses are paid by the producing classes, and I have listened here with interest to gather what I might to carry to those who have asked me what the signs of the times are. I have listened to these admirable papers upon transportation, labor, packing, marketing, and distribution, all of which come in between the producer and prosperity. It seems to me as though what was nearest to us and most paramount to our interests had been avoided. You know every man looks to his own individual side of a thing; but let us look at this thing in a broad view. To-day the farmers of this country own but 22.57 per cent of the land that they cultivate. Fifty years ago, they owned 55.57 per cent. The farmers to-day own almost two thirds less than they did fifty years ago. What does this mean? It means that the producing classes of this country, almost four fifths of them, are tenants, tramps, so to speak, who have no ambition and no inducement to build and locate their homes, but they work where they can work to the best advantage of their families, and the next year they move on. Look at the government where the people who have been the foundation and carried the burdens of the government have changed into a migratory people. Where is the stability of our government, if this is to proceed? I have been asking myself how shall this thing be remedied? I have come here to listen to the debates and the questions discussed here, hoping there might be some light brought out that I might carry encouragement to these farming people. This last question has brought up a question of all classes. During this time that the property has passed into the hands of moneyed institutions and out of the hands of the farmers, what do we find? We find that we have been farming to better advantage, that the crops are to-day greater than ever before, that nature has done her part, and yet we have not profited by it. We come right square to the question now. What is to be our relief from this thing? God and Nature have done their part, and why is it that the farmers of to-day are losing their hold upon their farms? If you could travel with me, as I have done the last three weeks, and see place after place with the remnants of the old garden fence, the tumble-down house, which a few years ago was started for a home, and nobody living there, you would say, "What is this country coming to?" Farmers, we are coming now, not to the question of production, but to the question of the distribution of our products. I am very glad to hear these questions of transportation brought up that we may the better understand them. From personal experience, I have found that before the grower can receive any benefit from his work in producing the fruit, he has to pay seven men. We must have a man to ship the fruit and the railroad must carry it. Why can not the railroad do this, and the wholesale man sell to the retail dealer, and we will all do better than we are doing now? This is a question for the producer, "How shall we get rid of supporting seven men before we can get our living?"

REPORT OF COMMITTEE ON TRANSPORTATION.

MR. STEPHENS. Mr. President, Ladies and Gentlemen of this Convention: In making this report your Committee on Transportation has endeavored to deal with cold facts regardless of whose interests they affect. We have given considerable time to the investigation of the situation, and I think that the gentleman who just sat down, speaking to the paper of Mr. Sprague, after he hears the report of the committee, will find a way to solve the problem he is so anxious to solve. I will state that the report is made up almost wholly of a communication which was addressed to Mr. William Sproule, Traffic Manager of the Southern Pacific Company, by the Committee on Transportation; in further explanation, I will say that up to the time it was announced that the Southern Pacific Company had entered into a new contract with the Armour Company, giving to that company presumably a monopoly of the carrying of our green fruit shipments for at least three years, the public was given to understand that no such contract would be given by the Southern Pacific Company. We had already assurances from the President of the Santa Fé that his company would not enter into a new contract with the Armour Company. Therefore, when the news came that the Southern Pacific Company had entered into a new contract with the Armour Company it came as a thunderbolt from a cloudless sky. I immediately asked Mr. Sproule if it was a fact, or simply a rumor. In that letter I stated what I have already said and claimed, that if the company had entered into such a contract, reserving no rights, or without any qualifications that would give to the Southern Pacific Company the right to annul or terminate it at any time, then the Lord have mercy upon the fruit-growers of California, because the Armour Company would have none. I said we would give to him statements and data showing the results of the past season, and of other seasons, together with the reasons why we protested on behalf of the fruit-growers of California against the renewal of the contract. I make this explanation so that you may understand the introductory part of the report as coming from the Committee on Transportation.

SACRAMENTO, CAL., December 2, 1902.

MR. WM. SPROULE, *Freight Traffic Manager, Southern Pacific Company, San Francisco, Cal.*

DEAR SIR: In a communication to you some time since, I promised to show that a contract between your company and the Armour Company which would give to said company—a private carline—a monopoly of carrying our fruit to Eastern markets, would, in all probability, prove disastrous to the interests of the fruit-growers of the State, and I now, in support of statements then made, present to you a tabulated statement showing the result to the growers of the shipment to, and sale of about 3,000 cars of green deciduous fruit in, Eastern markets; and I earnestly solicit and implore you to give all the facts and data submitted careful consideration and investigation.

The fruit-growers of the State, through their Committee on Transportation, have endeavored to show to the railroads interested in the transportation of deciduous fruit shipments to Eastern markets that something should be done by them to protect the fruit-growers against the avarice and greed of the private refrigerator carlines.

We feel justified in appealing to the railroads for relief in our own behalf, for the reason that tens of thousands of acres have been planted in orchards in California, at a cost of millions of dollars, by people who came here for that purpose, through efforts and representations induced by the railroads interested, with the result that the revenue derived by the railroads from green deciduous fruit shipments and other orchard products amounts to several million dollars per annum.

The granting to the Armour Company the exclusive right to carry green fruit shipments means that the company will have a monopoly of the business, so long as the contract is permitted to exist, and if there are no qualifications in the contract which will give to your company the right to abrogate, or, in other terms, terminate the contract at will, then it also means that the Armour Company will possess, without hindrance of any nature whatever, the absolute power to control ninety-nine per cent of all Eastern markets in which California fruit is sold.

Such a result will not only give to the Armour Company the control of shipments to Eastern markets, but also, for all practical purposes, the control of the deciduous fruit industry of the State throughout most, if not all, its lines, and thus will the profits from fruit-growing in California be diverted from a just and equitable distribution among the people of the State to the treasury of the Armour Company in Chicago.

You may ask, What has a contract—a contract that has no restrictions or qualifications in it that would give to your company the right to abrogate it at any time—to do with the marketing of our fruit in Eastern markets?

The answer to such a question is, that it is claimed, for apparently good reasons, that the Armour Company is, and has been, interested in the marketing of our fruit in Eastern markets. It is also claimed that the Armour Company intends to go into the fruit marketing business on a large scale, utilizing the cold storage facilities it has in so many Eastern cities and towns to hold the fruit until it can be sold at such a price as will bring to the company enormous profits on minimum quantities sold.

That through its monopoly of the carrying business it will be in the power of the Armour Company to do this is guaranteed by the fact, which fact can not be gainsaid, that it will have the power to apportion to each market the amount of fruit it shall receive, hence its power to glut such markets as its interests demand should be glutted and to put into other markets only such quantities as will bring to it the profit it may desire.

A question that has never been satisfactorily answered is, Why are the Armour Company's rates for refrigeration so much higher for California shipments than the rates charged for the same service for shipments from Oregon and Washington, where they are from four hundred to five hundred per cent less. The representatives of the Armour Company never have attempted to answer this question.

As Mr. Ogden Armour is supposed to be the controlling spirit in the Armour Company, it is but fair to judge what his company might desire to do with the fruit products of California, provided it has the power to control the disposition of these products.

Mr. Armour's recently reported deal in wheat values, whereby it is said he made $5,000,000, and his reported effort to get control of the potato crop on the Atlantic seaboard at a minimum cost and to sell it at a price that would bring him a return of two or three hundred per cent profit, shows, if true, how little he cares for the welfare of the producer as compared with the interest he takes in his own welfare.

It may be asked, What has all this to do with the fruit-growers of California or their interests? The explanation is this: It is a well-established fact, without a single exception, that one competitor can not pay to another competitor a heavy tribute, everything else being equal, and successfully compete with the one receiving the tribute, and if the exclusive right is given the Armour Company to carry our green deciduous fruit shipments at a profit for such service, it can use that profit, in any way that it pleases, to drive out all competitors in the fruit-marketing business, to the end that it may become the sole arbiter of that business.

The all important question, and that a question, too, in which every citizen of California who has the best interests of the people of the State at heart, is interested, is, Will the Armour Company succeed in its efforts to gain control of the fruit industry of the State?

There is no longer any doubt in the minds of any who have given the subject the least consideration, that for years the Armour Company has been arranging its plans looking forward to this end, and now the issue is forced through the efforts of the Armour Company to perpetuate its monopoly of carrying our green fruit shipments.

Arrayed on one side is a rich and powerful corporation, which accumulated its immense wealth, estimated by tens of millions, through the manipulation of markets in the sale of products that, through necessity, were commonly used by the great mass of people, and on the other side, the fruit-growers of California, too many of whom are almost hopelessly in debt, one of the worst features of which is that their financial obligations in most cases are held by those who are within the influence and power of the Armour Company.

The contest is an unequal one in so far as the financial standing of the contestants is concerned, and can only be won through the intervention of the influence and power of those whose millions outnumber those of the Armour Company, namely, the railroad companies whose financial interests will be materially affected by the result.

Those who have been in charge and had control of the distribution and marketing of our deciduous fruit shipments give, in the way of an explanation why our fruit brought such low prices, the statement that in the last few years orchard planting in Southern and Northwestern States has been conducted on a very large scale;

That the products of these orchards are beginning to come in, and are being marketed in competition with ours;

That the cost to the growers there for transportation, materials used, and the labor necessary to prepare their fruit for market, is so much less than the cost to our growers, that theirs can be sold at a much lower price than can ours, and still bring to them a handsome profit.

If this statement is correct, then it becomes an important factor in the settlement of the question as to what is necessary to be done, and how shall we proceed to do it, to make deciduous fruit-growing in California on a large scale profitable.

If after all things relating to the growing and marketing of fruit are taken into serious consideration no satisfactory solution of the problem can be gained, then it will be self-evident that deciduous fruit growing in California for the purpose of shipping green fruit to Eastern markets has not only reached its limit, but far exceeded it.

Then we can no longer look forward with hope to building up and promoting the interests of the State through the growing of such fruit, for which its soil and climate have been proven to be so admirably adapted, and unequaled by that of any other country; but, on the contrary, we will have to travel backward until we come to the balancing point, and a little more, which will give to the grower a living and reasonable profit.

Deplorable as it may seem, to accomplish this end, drastic and heroic action will have to be taken by the fruit-growers of the State.

As this is an era in which combination and organization seem to dominate all other things, and in consideration of the fact that the first law of nature is self-preservation, the grower will have to organize, if for no other reason than to raise sufficient funds to properly and thoroughly advertise the fact that deciduous fruit growing in California, from a paying standpoint, so far as the growers' interests are concerned, is already overdone; therefore,

It will be necessary to prepare and issue statements in keeping with the one mentioned in the first paragraph of this communication, which shows facts, plain, simple facts, as to the true condition in which we find our deciduous fruit-shipping business to-day, and to take such measures as will secure a thorough distribution of these facts throughout all localities where efforts have been, and are still being made to induce people to come here and invest their capital in orchard interests.

Such has been, and is, the policy pursued by the labor unions here, and it has been effective in preventing an over-supply of laborers coming here to the detriment of those who are already here.

This was not done without expense to them, but the money it cost, the result shows, was well invested. No other plan could have been adopted to promote and protect their interests.

Such action, however, should be taken only as a last resort. On the contrary, all other methods and means that are practical should be exhausted before such policy is adopted, for the reason that the fruit grown in California is the one thing, more than all others, that has advertised the State, and brought thousands and thousands of people here to see what kind of a country it is that grows such magnificent and superior quality of fruit.

However, if there is no other way in which deciduous fruit growing in California can be made to pay, then, as a last resort, the growers will have to do whatever is in their power to protect their interests, and as the plan suggested is the only practical one within their reach, force of circumstances will compel them to adopt it.

In all sincerity we assure you that there is no disposition or desire on the part of any member of this committee to do anything that would result in any way disadvantageously to your company, but, on the contrary, we wish to show you and to impress upon you, and other important officials of your company, the fact that something must be done to relieve the wants and necessities of the fruit-growers of California, and it is more in the spirit of supplication than otherwise that we appeal to you in the name of the fruit-growers of California, and ask that your company intercede in their behalf, to relieve them of an incubus that will, if permitted to exist, absorb all the profit there is in deciduous fruit growing in California, to the detriment, not only of the fruit-grower, but of the State as well.

We make this appeal because we not only believe, but we realize, that in your company lies the only and sole power to loosen the almost death grip that the Armour Company, through its monopoly of carrying our fruit shipments, has upon the fruit interests of California.

The time made in the transportation of fruit shipments has not been in keeping with the promises made by the railroads to the growers and shippers two years ago. On the contray, the service the past season was the worst ever given, and we now ask that the promises made in response to action taken by the fruit-growers of the State at their annual convention held in San Francisco, December 4–7, 1900, be carried out, which, if done, will certainly result in great good to all parties interested.

Yours respectfully,

R. D. STEPHENS, Chairman,
ALEX. GORDON,
A. H. NAFTZGER,
A. N. JUDD,
Fruit-Growers' Transportation Committee.

MR. STEPHENS (continuing). I will say that Mr. Alden Anderson, who is also a member of this committee, felt that he could not sign the report, not but that he agreed with it in many things, but felt that the cart was being put before the horse. This is respectfully submitted to you, gentlemen of this convention, and you are asked by the committee to take such action upon this report as your judgment dictates. It is your duty to consider it well and carefully. There is no doubt, in the minds of the majority of this committee, and it is the opinion of a great many outside of the membership of this committee, that this is the paramount question of all others, and while I agree with Mr. Sprague that combination and organization, to the end that growers can market and distribute their fruit, would be one of the grandest things that could happen to California, I say to him, in all sincerity, that such an organization can not compete with the Armour Company and pay the tribute that amounts to hundreds of thousands of dollars per annum. The fruit that that company can gather through its merchants and financial obligations mentioned in this report will be of sufficient quantity to enable the Armour Company to demoralize any market it sees fit to demoralize, notwithstanding the markets of the organization of which he speaks. It is true that, to a very limited degree, the quantity of fruit in comparison with the haul could be shipped at a profit. Why? Because the company could not afford to demoralize its own market, when only one car was sent in very seldom, to drive competition out, and it can well afford to allow the association to market some of its cars at a profit. Let me say right here, and I will predict fearlessly, not believing for a moment that I will make a wrong prediction, that, unless there is some relief from this company, many of the shippers who are now in a combination known as the Distributers will have to take a back seat. There is no member of that organization that is independent of the Armour Company, or can exist independent thereof, though millions may be at his back. Whenever Mr. Ogden Armour says "Get out," he will have to get out, in order to save what money he may have already accumulated. I bar no portion of that combination, even though it represents fifty per cent of the amount of business that has been done by the organization this year. In my belief, it is only a policy that is being pursued by the Armour Company to allay fear for the time being, in order that it may get hold of those interests and defy all in the future. In my opinion, the association which is spoken of is permitted to do business through the sufferance of this company, and through that alone. They have fought to get this contract renewed, and I believe now that the Southern Pacific Company has given no contract giving to that company absolute monopoly of the carrying business without some qualifications. I am given to understand that there are some qualifications. Now, ladies and gentlemen of this convention, it lies with you, as the representatives of the growers of your district, whether you have the force of character and stamina and manhood to say to the railroad company that we do not want this contract renewed on unconditional terms. Now, if that is your spirit and disposition, I, for one, know that the railroad company is as sensitive as you are about its interests. It has been stated to us upon this floor, by an official of the Southern Pacific Company, that if the growers would organize and speak to the railroad company through one source as one man, then they would be listened to, and whatever request was made would be given careful consideration; but divide them and no attention will be paid to the growers, any more than was paid by the employers to the employés when they made individual demands that their grievances be relieved. I believe it is out of the power of the growers to organize on any other basis. If the growers who still have property interests would contribute from $50 to $100 to advertise such facts as these through the papers and see that they are distributed throughout the United States, it would soon bring results.

MR. JACOBS. I am in favor of the report of Mr. Stephens, except that part of it relative to notifying the Eastern people with reference to the conditions in this State about transportation. As a native of California, I say we have the greatest State in the Union, and I do not believe in advertising to strangers that we do not possess enough everyday common sense to work out our own salvation; if that is so, we do not deserve any more than we are getting. These things will be evolved at the proper time. If the State will organize on the basis laid out by Mr. Naftzger at the last convention, there is no doubt but that the railroads will come to time.

I move you, Mr. Chairman, that that part of the report relative to notifying the people throughout the East of conditions detrimental to fruit-growing in this State be stricken out, and I think every one of us who has the interests of California at heart will vote in favor of striking it out.

MR. NAFTZGER. As a party to that report, I think perhaps I might properly say a word or two. Mr. Stephens stated to the convention that this report is in fact a letter addressed to Mr. Sproule, Traffic Manager of the Southern Pacific Company, and I said to Mr. Stephens, some of these statements are within your knowledge, not within mine, and I take it upon your statement of it. Now, I agree with those who say there is nothing the matter with the orange business. I assume that Mr. Stephens has told the facts about the condition of the fresh fruit business. It is for you to judge whether you agree with him in that statement or not.

MR. STEPHENS. Do you believe that that part of the report where it implies that the Armour Company has been in the fruit business, marketing fruits, is true?

MR. NAFTZGER. If you will give me a minute's time, I will tell you whether I think it is true. I was about to say that it is my belief that it is the plain duty of the fruit-growers of California to set their faces firmly to the eradication of the private carline. I said that to the Southern Pacific Company in frequent private talks I have had with them; there is no misunderstanding between us on that subject. That is my opinion, publicly and privately expressed. We found that in the orange business it was impossible to do otherwise, and that it was absolutely necessary to eradicate the private carline under the ownership of a fruit-shipper, and we did it. That fruit business and carline were sold to the Armour Company. When we forced it out of the hands of one shipper, we forced it into the ownership of the Armour Company. I say that on the statement of Mr. Robbins, the manager of the Armour carline. They not only bought the C. F. X. carline, but they bought the Earl Fruit Company. I will say further, in Mr. Robbins's behalf, that he said, "We have now no interest in the fruit company." I know this, that it is believed in transportation circles that Armour & Co. own and control the Earl Fruit Company to-day; I know that it is the opinion of the transportation companies, and I am prepared to say that it is my opinion most unqualifiedly. I don't think there is any doubt about it. Armour & Co. tried to go into the orange business, and it was only the continual and absolute declaration that there would be war if they went into it that kept them out of it on the surface. We are tired of this intertangling of interests and private carlines, and I tell you that, so far as the Southern California Fruit Exchange is concerned, from now on to the end of the chapter, we are against the private carline, first, last, and all the time. And you will never clear the atmosphere until you do this also. I don't say that we put ourselves in the attitude of demanding of the Southern Pacific Company that they instantly remove it, because it might have been impossible to get equipment to move the goods without making arrangements with somebody who owned the cars. I believe it was the plain duty of the Southern Pacific Company not to enter into any irrevocable contract, and if they did do it, they should be punished, if they can be punished. I am not so sure it can be done.

Now, I call attention to the conditions in Oregon and Washington. A few days ago I was there and was talking to a gentleman, who told me that for years he had been a shipper of fruits out of Oregon, and he says, "I pay nothing but the initial icing, usually $15. Sometimes I do that myself, and thereafter the company ices it to destination, and does it thoroughly and well and charges me nothing whatever for it." Now, I say this is little less than an outrage that the fruit-shippers of California shall pay from $80 to $120 per car, when your neighbors on the north can have their cars refrigerated for $15 and carried to market in as good an equipment as he ever saw. That is a discrimination, and no transportation company should be defended or apologized for that will engage in that class of traffic. And the California fruit-growers can not do better toward getting the ground cleared around them for proper transportation than to do away with the private carline business.

MR. JUDD. I move that the report of the Committee on Transportation be adopted as read.

Here followed a lengthy discussion, which resulted in the adoption of the entire report of the committee.

INVITATION FROM CALIFORNIA PROMOTION COMMITTEE.

The following invitation was received from Rufus P. Jennings, Executive Officer of the California Promotion Committee:

MR. J. J. KEEGAN,
Secretary California State Fruit-Growers' Convention,
Pioneer Building, San Francisco:

DEAR SIR: The California Promotion Committee of San Francisco extends cordial invitation to the California Fruit-Growers' Association, in convention assembled, to visit its headquarters, 25 New Montgomery Street, where every attention and courtesy will be shown your members.

It is evident that it will be to our mutual advantage to co-operate in advancing the interests of our State in the promotion and development of its vast resources, and to that end will do whatever possible to assist your organization in its work.

Cordially yours,

RUFUS P. JENNINGS,
Executive Officer.

MR. JACOBS. I move that the invitation be accepted by this convention, and that our thanks be extended to the Promotion Committee for the work it is doing in behalf of California.

The acceptance of the invitation was opposed by Mr. Stephens, on the ground that the members of this convention could not conscientiously recommend California and the objects of the Promotion Committee in bringing settlers here under the present conditions as outlined in the report just read by him.

A general discussion followed upon the acceptance or rejection of the invitation, which resulted in the invitation being laid on the table.

A recess was then taken until 9:30 o'clock Thursday morning, December 4th.

THIRD DAY'S PROCEEDINGS.

THURSDAY, December 4, 1902.

The convention was called to order promptly at 9:30 A. M. President Cooper in the chair.

PARASITIC AND PREDACEOUS INSECTS IN THE ORCHARD.

BY ALEXANDER CRAW, OF SAN FRANCISCO.

"In no country in the world has the possibility of control of insects by introducing and fostering their natural enemies been so thoroughly tested as in California. The very notable instance of the entire eradication of the white scale by the introduction from Australia of its ladybird enemy, *Vedalia cardinalis*, demonstrated the possibilities in this direction in the most striking way. This one experiment saved the State its citrus industry, or the equivalent of many millions of dollars, and gave the greatest confidence in many quarters in this means of controlling insects, as well as incited the later action looking to the introduction of beneficial insects on a much larger scale."

This was the conclusion of Professor C. L. Marlatt, First Assistant Entomologist, U. S. Department of Agriculture, after an extended investigation of the subject in this State.

Besides the *Vedalia* and its five imported co-workers that keep the "cottony cushion scale" (*Icerya purchasi*) under control, we have numerous others that have proved of equal value to the orchardists of California. When an insect is causing damage in our midst, the attention of our orchardists and farmers is specially called to it, and the subject is fully discussed at our fruit-growers' conventions and farmers' clubs. When our insect friends become established among the pests, the result is a gradual decrease in the latter until few remain, and our trees and plants, at last relieved from the great drain and the poisonous effects of the scales, soon recover their wonted vigor and the orchardist forgets his tribulation. A case of this kind was recently called to my attention by an incident at a farmers' institute. The question was asked, "Does any one know of an instance of benefit from parasites outside of the *Vedalia?*" No reply was made, and the implication would have gone unchallenged had it not come to my notice, as the subject—although understood by our growers—requires some technical knowledge to discuss in public. I was not present, but replied through the press, and gave a list of scale insects, including the "soft orange scale," the "yellow scale," the "San José scale," and the "brown apricot scale," as well as other insects that are now held in check where their parasites have been established. All the above, besides a number of other scale insects, were formerly as destructive as the "red" and "purple" scales are to-day.

In introducing parasites and predaceous insects, species that live upon other insects, the orchardists and farmers can rest assured that they will never change their food and become pests themselves. No matter how hungry they are, we can not induce them to eat the most delicate foliage or fruit; in fact, they will die of hunger before they attack other than the insects on which they are parasitic. While this is true, it is not safe for an orchardist to write to a friend in a foreign country requesting him to send such insects, for the reason that parasites have frequently other parasites that prey upon them, and great care has to be exercised to exclude these secondary parasites, or rather to destroy them should any appear.

Occasionally when we send out colonies of insects by mail the recipient writes back stating that he has so many acres of orchard infested and would like to have enough parasites sent to clean up his trees so that the coming crop will be free from smut. The State Board of Horticulture would be more than pleased to comply with such requests, but generally each applicant receives more than reached us alive in the original importation and from which the entire State had to be supplied.

Others again are too impatient, and a few days after receiving a colony write that they can see nothing of the parasites and had received no benefit from them and from no fault of theirs, as they had followed our instructions. This is not surprising, as most of the parasites are very small, in fact, some of them are nearly microscopic.

In the case of internal chalcid parasites, they pass nearly all their existence inside their hosts and only a short time in the perfect state after issuing. In that time they deposit their eggs for a succeeding generation. People not acquainted with their method of work suppose that they bodily devour the scale, aphis, or other insects they attack, and thus remove all evidence of the pests. This is not the case. The female parasite pierces the scale with her ovipositor, depositing in most instances only a single egg in each scale. This hatches into a small, white, footless, blind grub, which soon devours the body of the scale as well as the eggs. It changes into a pupa and then to the perfect fly, still under the scale. With its mandibles it gnaws a small hole through the back of the scale, and makes its escape.

This is substantially the transformation of all Hymenopterous and

Dipterous parasites. The latter are two-winged flies, and with few exceptions are parasitic upon caterpillars and chrysalids of moths and butterflies. A few prey upon some large scales and very few upon beetles. In fact, the first Dipterous parasite ever known to attack Coleopterous insects was discovered by the writer eating out the vitals of the destructive twelve-spotted Diabrotica. From thirty to seventy-five per cent of the latter are destroyed by this parasite. Without this check these beetles would eat up nearly every delicate plant, flower, and fruit. Unfortunately, the Diabrotica breeds in the ground, feeding upon the roots of chrysanthemum and other soft-rooted plants, and is thus protected from parasites or artificial remedies. When they develop, they do some damage before their parasitic flies increase sufficiently to check them.

Among the beneficial Coleoptera (beetles), by far the most important are the various species of "lady-birds." All the species found in California are beneficial. The majority of them are aphis-feeders, but quite a number assist materially in keeping down certain scale insects; as, for instance, the "cottony cushion scale" is held in check by the *Vedalia cardinalis*, *Novius koebelei*, *Novius bellus*, and the "black Vedalia," reinforced by two internal parasitic flies, *Lestophonus iceryæ* and *Dphelosia crawfordi*. In certain sections near the seacoast, notably in the orchards of the Hon. Ellwood Cooper near Santa Barbara, the Australian black lady-bird (*Rhizobius ventralis*) has done splendid work against the black scale. By persistent effort on the part of Mr. John Scott, of Duarte, Horticultural Inspector W. H. Payne, of Monrovia, and other orchardists, it is becoming acclimated more inland. Mr. William Barry, Horticultural Commissioner of Alameda County at Niles, has kept the orchards of his district in good condition by the continuous distribution of this and other beneficial insects. As soon as scale appears in an orchard, he immediately places the proper parasites or predaceous insects therein, and the spread or increase of the pest is checked. The orchardists of his district speak in very complimentary terms of Mr. Barry's work in this direction.

When an orchardist receives a colony of lady-birds from the State Board of Horticulture, all that is necessary is to liberate them in an orchard having an abundance of the proper scale, and they will attend to their business without any further assistance from the grower.

The manner of propagating lady-birds differs from the colonizing of Hymenopterous parasites before referred to. With the lady-birds the aphis-feeding species generally deposit their eggs in clusters when the feed is plentiful, and these are attached by a glutinous substance to the leaves or stems of the plants on which they are placed, usually standing at right angles from the leaf or stem, and generally are of an orange or yellowish color. The *Vedalia* eggs are red, resembling the eggs of the cottony-cushion scale, but smoother and deeper in color, and are laid singly by the female on the surface of the cottony sac. The *Rhizobius* eggs are pearly white and pushed under the edge of the scales by the lady-bird. The young, or larvæ, of all the lady-birds have six legs, their bodies are long, without any resemblance to the mature insect. This frequently leads to the belief that the insects are a failure.

In a paper read before the last Fruit-Growers' Convention, I referred to a new internal parasite of the black scale that the State Board of Horticulture had received from Prof. Charles P. Lounsbury, Government Entomologist of Cape Colony, South Africa. Seventeen of the parasites reached us alive, but only four were females. Unfortunately, one of the latter was killed by a small spider, leaving us but three females to attempt the colonization of this valuable insect in the extensive orchards and brush lands of California. We have succeeded beyond our most sanguine expectations, and six generations of *Scutellista cyanea* have been bred and distributed in all the counties where black scale is troublesome. In South Africa this little parasite keeps the black scale completely under control. Colonies placed in orchards in this State have gone through all their changes in the brief space of forty-seven days. This is extraordinarily rapid work when we take into consideration the fact that that effective internal parasite (*Comys fusca*) of the "brown apricot scale" takes one year, or rather but one generation is produced each year, and colonies can only be sent out to orchardists during the last week in May and first week in June. Colonies of *Scutellista* have been liberated upon orange, lemon, olive, prune, oleander, English holly, and pepper trees infested with black scale, and in each instance the parasites have attacked the scale and their young maggots have bred therein. This is certainly encouraging, as the celebrated *Vedalia cardinalis* positively refuses to eat cottony-cushion scale raised on laburnum and a few other trees and plants.

The well-known pepper tree, with its pendent twigs and deep, green, glossy, fern-shaped leaves and bunches of bright red berries, has in recent years become an eye sore and nuisance, as it is a veritable breeding-place for the black scale. It, however, bids fair to be restored in public estimation as one of our favorite street and avenue shade trees, for the *Scutellista cyanea* has evidently taken hold more kindly to the scales thereon than other beneficial insects have done.

The following extract from a letter dated November 3, 1902, written by Mr. J. W. Jeffrey, Secretary of the Los Angeles County Horticultural Commission, is interesting: "Mr. Strong visited an orchard in Pasadena to which you had sent a colony. He found at least a dozen *Scutellista* in the puparium stage on a section of a pepper limb *not two inches long.* The puparia have since all become transformed into the liveliest flies I ever saw. I am usually very conservative, but I confess to an inclination verging to great expectancy. Never was there a question of so much importance to our citrus fruit-growers."

Mr. Jeffrey could have included other than citrus fruit-growers, as the black scale is a very general feeder and one of the most difficult to control by sprays or fumigation, because in recent years it has been very irregular in its breeding season, and on this account scales can always be found containing eggs, and when in that condition it is difficult to make thorough work with either gas or sprays.

In all my experience with parasitic and predaceous insects, I believe that *Scutellista cyanea* will prove to be one of the most valuable yet introduced into California.

WORK OF THE ENTOMOLOGICAL DEPARTMENT OF THE UNIVERSITY OF CALIFORNIA.

By PROF. C. W. WOODWORTH.

The more intimately one becomes acquainted with the agricultural conditions in California, the more will he be impressed with the diversity of these conditions. Even where the same crop is grown on a commercial scale, the character of the product shows noticeable differences; for instance, the orange of northern and southern California, the prune of the Santa Clara, Sonoma, and San Joaquin valleys, the peach of Placer and Sutter counties—but it is needless to multiply instances. With the insect fauna the diversity is even more striking. The vine-hoppers of the San Joaquin and Santa Clara valleys belong to two entirely different genera. The grasshoppers this year in the San Joaquin and Sacramento valleys also belong to two different genera with essentially different habits. The peach-tree borer has been able to maintain itself only in the Santa Clara Valley. The San José scale, the peach-worm, the vine-hopper, the red spider, the canker-worm—indeed, nearly all of the most injurious insects of the State—find the conditions at Berkeley uncongenial to them. In fact, there is no injurious insect that is troublesome over the whole State and very few that are not remarkably local. Furthermore, the same insect often possesses essentially different habits in the different regions. The codling-moth, for instance, one of the most widespread pests in the State, doing injury in nearly every apple and pear growing section, is so different in its habits in the different regions that the method of treatment entirely satisfactory in one situation would be wholly inadequate in another. Sometimes a very little distance, not over four or five miles, as in the Pajaro Valley, will make all the difference in the world in the method of treatment necessary.

Because of this remarkable diversity of conditions the study of injurious insects must be made in the particular localities where the injury is done. Much that might be learned about an insect at Berkeley will be certain not to apply in any other region. Indeed, it is probable that the situation at Berkeley is as different from the orchard areas of the State as any locality that could be selected.

In the early days of the Agricultural College, Professor Hilgard, recognizing fully this fact, urged the necessity of establishing substations over the State, in order to be able to make cultural experiments, which might be comparable with those obtained in the various agricultural regions. This was the reason of the substation system which we now possess. The localities selected for these substations are probably as good as could be chosen, but the criticism is continually heard, even in reference to them, that they do not represent any large area, growers often in the immediate vicinity of the sub-station saying that there is an essential difference between their locality and that of the neighboring substation. In order to adequately cover the State, therefore, it would be necessary to still further increase the number of stations, and even the present number is beyond the financial ability of the Experiment Station to properly maintain. So keenly do we feel this at Berkeley that it is probable that unless provisions, such as those recommended by the State Grange at its last meeting, are adopted whereby some of the expense of the substations will be borne by direct appropriations of the Legislature, it will be necessary for us to discontinue them In some form the substation idea, however, is the correct one. There is no other way to adequately study the agricultural problems except by going into the various agricultural regions. The location of the central station at Berkeley, away from all the important agricultural areas, would have been a great mistake had there been any one great agricultural region whose needs would predominate over those of all other sections. No matter where the station might have been located, its immediate surroundings would be essentially different from the major part of the State. It appears, therefore, that since the station belongs to the whole State, it is really a fortunate thing that the central station is thus entirely removed from any great agricultural region, in order that it may impartially cater to them all. Berkeley must be recognized, therefore, as simply the administrative center, where are situated the chemical and other laboratories in which more abstract problems are investigated and from which the members of the staff go forth into the various regions, as the demand arises, and investigate the peculiar problems of each locality.

The past year is the first one in which the funds of the Station have made it possible for the entomological department to undertake serious outside study. Heretofore, the entomological work attempted was without assistance, sufficient equipment, or funds, and has been done in addition to very engrossing duties in the lecture room and laboratory in the instruction of large classes of students, as well as being, to a large extent, at a distance from the real location of the trouble. As a consequence the results obtained have been meager and unsatisfactory. Real Experiment Station work in entomology can not thus be said to have been inaugurated until this year, and the results obtained, we believe, amply justify its continuance. The work done this year would not have been possible but for the very liberal and hearty co-operation of two counties in the State—Placer and Los Angeles—the former directly by the Board of Supervisors, and the latter by the Board of Horticultural Commissioners, and I trust the system of co-operation thus started may be continued, for in this way larger results will be obtainable than otherwise possible. The fact that most of the problems are, to a large extent, local problems is the reason that individual counties should contribute a share of the expenses. Part of the results of this season's work has already been published, in Bulletins Nos. 142–145 of this Station, which have already been distributed, and with which you are doubtless familiar.

The work began by the detail of Mr. W. T. Clarke for the investigation of the peach-worm in Placer County, where he was able to accomplish a very notable piece of work. The saving in that county alone during the present season, I think, has easily been large enough to pay for the continuance of this kind of work for a hundred years, and the good effects will not stop here; but the peach-growers of that region feel that now they have the mastery of the peach-worm, an insect whose annual injury the past four years has amounted to over $300,000 a year. The clue to the solution of this problem was discovered as early as February of the present year and published at that time in a press bulletin. It yet remained to be demonstrated by actual field work that a correct timing of the treatment, which was the essential element of Mr. Clarke's discovery, would result in a sufficient decrease in the injury produced by the insect. This he was able to amply establish, by convincing the peach-growers of Placer County of the soundness of his deductions so that a large majority of them follow closely his directions. The great saving obtained in that region this year was thus brought about. There is no doubt, judging by the returns of non-sprayed orchards, that the present season was more than usually favorable to the peach-worm, and that, therefore, the results obtained by spraying this season, amounting in some cases to a reduction of the loss to below one per cent, can be duplicated in the coming years.

The history of the discovery of the means of control of this insect is as follows: The first significant observations, I believe, were made known by Mr. Stabler, of Yuba City. He reported that when spraying was done for San José scale the peach-worm almost disappeared. This suggestion has been used for many years in Placer County and in other parts of the State, sometimes with good results and sometimes with apparently no results. The next contribution to the economic knowledge of the insect was Mr. Ehrhorn's very important discoveries in regard to the winter habits of the worms, which had been repeatedly referred to in previous annual meetings of this convention. This discovery explained the reason for the efficiency of the lime, salt, and sulphur application, as reported by Mr. Stabler, but did not explain the failure of this treatment, which occurred more often than its apparent success. Mr. Clarke's contribution consists in the demonstration of the impossibility of penetrating the winter burrow, on account of the very perfect protective character of the silken lining, and after working out very carefully the spring habits of the worm he discovered the vulnerable point at which it could be successfully attacked.

The next piece of work undertaken was an investigation of the peach-tree borer, at the instance of Mr. Ehrhorn, and with his very kind assistance and co-operation. Observations were made by myself and by Professor Washburn, formerly of Oregon, now of Minnesota, but more urgent matters demanded the attention of the department, so that the work was not carried to the point desired. The practical conclusions reached, however, seemed of enough importance to publish, and may be found in Bulletin No. 143. The use of carbon bisulphide for this insect is a remarkably cheap and efficient method of treatment, and while much experimental work remains to be done and should be provided for in the near future, enough has been learned to enable the grower to avoid the danger to the tree, which has stood in the way of many who would have otherwise adopted this insecticide.

The all-important point brought out by this study was that the character of the soil, whether loose or heavy, wet or dry, was the chief factor to be considered in the use of this chemical. The same dose might result in one case in the death of the tree, and in another be insufficient to kill the borer. Between these two extremes of soil condition there is a very wide range, in which the results are all that can be desired. It is our belief that intelligently applied carbon bisulphide can be used with the best of results under all conditions in which the trees are grown.

A beginning was made in the study of the red spiders of the State. Mr. W. H. Volck, a student in the department, was appointed an inspector by the Los Angeles Board of Commissioners, and has conducted most of the experiments, working under my direction. We have been able to clear up the life history of this creature in a very satisfactory manner and to make positive recommendations as to the time for spraying. Perhaps the most valuable part of the practical conclusions arrived at has been the comparison of the various insecticides, to determine which is most effective and economical. Only a portion of the results are reported in Bulletin No. 145, which is just appearing after many annoying delays in printing. The species studied (*T. mytilaspidis*), attacking citrus trees, is by no means the most injurious one in the State, but had caused a great deal of apprehension among orange-growers. The *Bryobia*, on almonds and other deciduous fruits, does much more injury and is in need of just such a study, in order that the remedial measures can be intelligently applied. This group of fruit pests is of such importance in this State that it is high time a beginning should be made in their study. The extremely minute size of these creatures renders this work exceptionally difficult, as everything must be done under a microscope and with the most delicate manipulations. Mr. Volck has done very persistent, painstaking work and is exceptionally resourceful.

The most notable entomological occurrence of the year was the outbreak of grasshoppers over a wide area of country, but particularly in Sacramento, Fresno, and Tulare counties. The injury produced was not as heavy as has occurred in these same regions in former years, but amounted to a great deal in the aggregate. The newspaper accounts of this grasshopper invasion were decidedly sensational, and gave undue prominence to the fact that the cultivated lands of this State are subject to migratory locusts. That such is the fact every one acquainted with these insects is well aware. Arid uplands are always the breeding-grounds of migratory locusts. The locust breeding-grounds in this State are really not extensive and we are protected by high mountains from the great plateau regions to the east. The problem, therefore, of grasshopper control is by no means as difficult here as in most of the regions subject to this pest. The possibility, indeed, of complete control on the breeding-ground, whereby our orchards and vineyards might entirely escape injury, is shown and discussed in our Bulletin No. 142.

The efficiency of arsenic-bran mixture, under certain conditions, was again demonstrated this year, being used on a large scale in each of the districts where much injury was done. Here, as in the case of the peach-worm investigation, it was found necessary to go into the field and actually demonstrate the methods of procedure, in order to secure the best results. It should be considered an important part of the work of economic entomologists to put their work into actual practice. No matter how many useful facts may be learned about insects, unless the growers can be made to believe in them and to use them to the saving of their crops, the study falls short of the real end for which it was made.

The recommendation of President Cooper for an appropriation for the study of the natural enemies of the grasshopper should certainly be carried out. We can not afford to allow any means for the control of this pest to go uninvestigated, and therefore should also provide amply for a complete study of the whole situation.

The study of the distillates of the California petroleum as a spraying material has been carried on, but has not yet yielded results sufficiently conclusive for publication. There is no doubt but that this material will prove to be of very good service as an insecticide. Already it occupies an important place as a scale-insect destroyer. As compared with kerosene oil its efficiency is proven to be decidedly greater. The difficulty that has stood in the way of its more extensive use has been the lack of uniformity of the product and, therefore, the unreliability of the result, particularly with reference to the injury to the plant. Our investigations have been directed toward establishing criteria for the economic classification of oils and distillates and the determination of the fundamental facts in reference to the cause and injury. In the first part of this study I have had the co-operation of Mr. Colby in the chemical work, and in the plant pathology problems I have been assisted by Mr. Volck, in connection with his work on the red spider in Southern California. We expect to be able to begin the publication of the result of these studies this coming season.

Since the beginning of the fumigation season we have had Mr. Hunter in the field measuring tents, in order to determine the actual dose in use in this State. The measurements he has brought back show a great need of improvements in the method of estimating the amount of chemicals to be employed. The need of greater knowledge of the facts involved in our farming operations is brought out with peculiar force in this case. There is expended each season in this operation of fumigating orange trees in this State upward of $400,000, and the determination of the amount of chemicals used in each case is wholly a matter of guesswork. We had supposed that the judgment of those engaged in this work had become so developed that they could make fairly accurate estimates of the size of a tree, but after following the work of nearly every fumigator engaged in treating orange trees this season we failed to find a single individual who would not vary the dose to the extent of giving the same size tree twice as much gas in one instance as he did in another. It would seem to be a physical impossibility to accurately guess the size of a tree. Before the next fumigating season we will publish the results of this study and present a plan for rapid measurement and accurate calculation of fumigation tents, which should result in securing more uniformity and efficiency and possibly a material reduction in the cost of fumigation.

The most important investigation of this department the coming season will be located in the Pajaro Valley, where, according to the estimates made by the orchardists of that region, the losses this last season from the work of the codling-moth have amounted to over $500,000.

In other parts of the State this same insect eats up a large part of the profits of apple and pear growing, and its habits differ so much in each locality that several separate investigations will have to be made before we shall have sufficient knowledge to intelligently combat the insect and rid our market from wormy fruit. Many other insects also demand our attention, but the very limited means at our disposal makes it necessary to defer their study.

I can not close this review of the work of this department without referring to the very cordial relations which have existed between it and the members of the State and County Boards of Horticulture, making possible in some cases efficient co-operative efforts, and everywhere resulting in mutual helpfulness.

THE BLACK PEACH APHIS IN CALIFORNIA.

Aphis persicæ-niger, Smith. (*Aphis prunicola*, Kalt.)

BY PROF. WARREN T. CLARKE.

Our California climate offers a cordial welcome to a great variety of trees, both useful and ornamental; at the same time it also offers as cordial a welcome to the insects which prey upon these trees. Sooner or later, in spite of the conscientious and intelligent inspection made by our State and County horticultural officers, many of the insect pests known and feared in other localities have appeared here, and the problem of how to control them has presented itself for our solution.

It is of such an introduced pest, the black peach aphis, that we will speak in this paper. This insect is a member of the family Aphidæ, which is the largest of four closely allied groups. These four groups belong in the order Hemiptera, the true *bugs*, and entomologists have brought them together under the name Sternorhynchs. This name indicates that the mouth parts of the various members of the general group are apparently placed on the breast of the insect. The other three insects, grouped together because of this character of the mouth parts, are the Psyllidæ, or jumping plant-lice, the Aleurodidæ, or white-flies, and the Coccidæ, or scale insects, which need no introduction to California horticulturists. All of these insects obtain their food by puncturing the tissues of the growth attacked and sucking the juices.

The black peach aphis is scientifically known as *Aphis persicæ-niger*, which is merely its common name duly Latinized. What is now claimed by some entomologists to be the same insect was described and named by Kaltenbach *Aphis prunicola*, and if the identity is proven then this latter name will supplant the former, as it has the right of priority. How this may finally be decided is not pertinent to the purpose of this paper, and it is sufficient for us to know that we have to deal with the black peach aphis of the Eastern States.

The injury done by it in that part of our country has at times been very considerable. Slingerland, in Cornell University, Agricultural Experiment Station Bulletin No. 49, December, 1892, says that then the insect was "very common throughout the whole of the great peach-growing districts of New Jersey, Delaware, Maryland, and Virginia. Growers there say it is more to be dreaded than the borer (*Sannina exitiosa*), and in destructiveness it ranks next to the fearful mysterious disease of peach yellows. Trees less than three years old suffer the most. In 1890, nearly 100,000 in a single nursery, in one of these States, were killed in two or three weeks' time, while many other large nurseries were either entirely destroyed or very badly affected, and many orchardists were compelled to replant hundreds of trees." The destructive capabilities of this aphis are reasserted by Prof. S. A. Forbes, State Entomologist for Illinois, in Circular No. 36, University of Illinois, Agricultural Experiment Station, July, 1901. Special attention is called to the danger attendant upon the possible presence of the aphis in nurseries. Indeed, the black peach aphis is recognized in peach-growing sections everywhere as a most dangerous enemy to the industry.

During the spring of the present year (1902), the writer was located in the extensive peach-growing section of Placer County. In the latter part of March, when the spring growth of the peach trees was well started in this section, an aphid was noted seriously injuring the young and tender leaves and twigs. In some orchards the aphids were found on occasional trees and not generally distributed, while in other orchards solid blocks comprising many trees were infested. Infested trees were found in all parts of the region noted, which is some fourteen miles long and from five to ten miles wide. Indeed, we may say that no part of this section was at that time entirely lacking an infection point. This does not mean that no orchards or trees were free from the pest, for indeed on very many places no aphids were found, but rather that no extensive area was found from which the aphid was entirely absent. We were able at the time to identify this aphid as the black peach aphis, and this identification has since been confirmed by Dr. L. O. Howard, Entomologist for the United States Department of Agriculture.

As to when and how it was introduced into the State we can only conjecture. We attempted to follow up the history of the insect in the Placer County region, and learned that it was first noted seven years before, in 1895. This date is based merely on verbal statements, and probably means that it became *numerous* enough to be noticeable at this time. Since then there has been a steady spread of the pest in the region, until now it is, as above noted, well distributed over the section in question.

The black peach aphis is a characteristic member of the family Aphidæ, and is a small brownish-black insect, which appears in two forms—the wingless and the winged. The adult apterous, or wingless, insect is about one tenth of an inch in length. When examined under a hand lens it will be seen that two short processes extend from the posterior dorsal side of the abdomen of the insect. These processes are known as the nectaries, or honey-tubes, and through them the insect ejects a sweetish fluid known as honey-dew. When it is not eating, the insect keeps its rostrum or beak close against its breast. When eating, this beak is held at right angles to the body and against the leaf or twig on which the aphid is resting. This is pierced by four fine, bristle-like organs, which are the modified jaws, and through this arrangement the sap is conveyed into the body of the insect. The winged individuals, which are usually found accompanying the wingless ones, but not in such large numbers as these latter, have four comparatively long, transparent wings, which are carried roof-shape above the abdomen when the insect is at rest. These winged individuals are somewhat longer and more slender than the wingless specimens and are darker in color. They also have longer antennæ and nectaries. The winged aphids are able to fly to other trees at a greater or less distance, and the infection may thus be spread, for each of these winged ones may become the progenitor of a new colony. The young aphids are similar in appearance to the apterous adults, differing only in being smaller and lighter in color. The life history of the black peach aphis has not yet been fully worked out. It presents, however, features that are common to all plant-lice and which render the whole group extremely interesting. In the group the phenomenon of parthenogenesis, or reproduction without the intervention of the male, is quite common and undoubtedly the rule with the black peach aphis, for the male has not been observed by me in California, nor by others in the Eastern States, so far as I have been able to learn. While among the Aphidæ the mother insect may be either oviparous or viviparous, the egg-laying female of the black peach aphis has never been observed, and so far as we now know the species is carried forward through the year, and from year to year, by the agamic, viviparous females. These mother aphids produce their young with great rapidity. Several specimens which were kept under observation by me last spring reproduced at the average rate of six living young each day, and one mother kept this up for fourteen days, having in this time given birth to eighty-four young. The young aphids begin to produce offspring in from three to five days, and the possible rate of increase is thus astonishingly large. When we consider that each little aphid as soon as it is born forces its setaceous mouth parts into the tissue of the plant on which it finds itself and begins to suck the sap, we can see what a drain these insects may become upon the trees they infest.

A further item in the history of the black peach aphis that renders its presence the more to be feared, is the fact that it attacks the roots as well as the leaves and twigs of the tree. Apterous forms only are to be found upon the roots, but these are continuously produced in this situation. These root-infesting aphids may be found on the smaller roots, from three inches to a foot or more beneath the surface, and usually occur in isolated colonies.

The characteristic and conspicuous attack of the aphids above ground begins in the spring when the young shoots appear. At this time many of the aphids from the wintering colonies on the roots move up to the leaves and twigs. They are usually first noticeable upon the young growth on the lower parts of the tree. If the attack is severe the tree will soon be literally covered with the lice. The effect of these thousands of insects, each pumping out the sap, is disastrous to the tree.

This above-ground attack, while it may be fatal in the case of young trees, is not so much to be feared, on older trees, as the work on the roots. When the tree becomes badly infested with the root form of the aphid the drain on it is so great that its productiveness is seriously hampered, and in time death is sure to follow. This is the fact in Eastern States, for Slingerland, writing of this insect in New York*, says, when referring to the root form: "Its deadly work frequently appears when there is nothing to indicate the existence of an insect as its cause. A stunting or dwarfing of the young trees is one of the most marked symptoms of the presence of the pest. Sometimes three- or four-year-old trees are but little larger than when first set. The foliage of such trees presents a yellowish-green, sickly appearance. Rarely a tree after languishing a year or two recovers and makes a good tree. Under favorable conditions the insect may appear in great numbers on the tree above ground and its growth be nipped while yet in the bud; the growing shoots dry up and the young tree soon dies." This description agrees exactly with what we have observed in this State, and it is certainly quite as deadly in its work here as in the Eastern States.

In one case that we were called on to investigate during the past spring, nearly every tree in a newly-planted orchard of six acres died from the above-ground attack of the aphids. In this particular case the young trees were planted on ground from which old trees had been removed a few weeks before. These old trees had been infested with the aphis, and the root forms had probably remained in the earth with the parts of roots not removed. When this ground was planted to young trees the aphids passed from the old roots to them and to the above-ground portions of the trees, and they succumbed to the overwhelming attack. The injury may vary, according to the abundance of the insect, from such complete destruction of the trees as this noted to a mere checking of the growth. When once the aphis is fully established, however, the utility of the tree is seriously inpaired, even if death does not immediately follow.

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*Cornell Univ. Agr. Expt. Sta. Bull. 59, 1892, pp. 427-433.

When the aphids appeared above ground they were invariably accompanied by one of the small black honey ants (*Myrmecocestes melliger*), which fed upon the "honey-dew" excreted by them. Slingerland (l. c.) states that in New York the "pest is often accompanied by a small yellow ant which has been seen transporting the aphids to places of safety. It is believed that the distribution of the root forms is thus facilitated by the ants, and they may also aid in getting the aphids to the surface in the spring." Many growers in the infested regions in California have noted the accompanying ants and some have supposed that they were destroying the aphids.

At no time have I observed any attempt on the part of the ants to remove or to destroy the aphids. While I have frequently observed the gathering of the "honey-dew" by the ants, any further relation between the ants and aphids remains still a conjecture. It is safe to say, however, that the ants do not destroy the aphids, but on the contrary are very friendly toward them and possibly they assist in the migrations of the lice, as hinted by Slingerland.

Many of the above-ground form of the black peach aphis were destroyed by predaceous enemies in the infested region during the past spring. Lady-birds (*H. convergens*) and their larvæ destroyed many of the lice, and also certain syrphus-fly larvæ and lace-wing fly (*Chrysopa* sp.) larvæ did good execution, yet at no time were these friends of the orchardist present in sufficient numbers to adequately control the pest. The rate of increase of the aphids was so great that their enemies had little effect upon them, and the final result was an overwhelming attack upon the tree. The approach of warm weather rapidly resulted in the destruction of all those remaining above ground, and the root colonies only remained to continue the drain upon the trees.

The root-infesting habit of this aphid renders its distribution by nursery stock quite possible, and indeed it was probably introduced into this State in this way. The necessity for careful inspection of peach nursery stock becomes quite evident, therefore, as we should strive to keep this pest out of sections of the State that are not yet infested with it. When the root form of the aphid is present on nursery stock it can be quite readily destroyed by dipping the young trees in a solution of one part kerosene or distillate emulsion to eleven parts of water, or by subjecting them to the fumes of hydrocyanic acid gas. The trees, if the emulsion is used, should be thoroughly cleared of all adhering dirt, and then allowed to remain in the solution for three or four minutes. In case the fumigation method is used, the trees should, according to the usual practice, remain in the gas chamber for about forty minutes. If either of these methods is used the insect can be killed.

If the aphid once becomes well established in a peach orchard or nursery it will be found to be a very difficult insect to combat. We have found that the leaf and twig infesting forms are easily killed by a spray of either kerosene or distillate emulsion in the proportion of one part of the emulsion to eleven or twelve parts of water. It would be well to use a spray of this character wherever the aphid is seen above ground, as by this means we can prevent the winged individuals from spreading to adjacent trees. When the aphids are at work under ground, probably the safest and most economical plan is to carefully remove and burn the affected trees. Before this removal is begun, however, the aphids on the leaves and twigs should be destroyed by means of a thorough spraying, in order to avoid shaking living insects onto adjacent trees and thus spreading the pests. Even though the affected trees are burned the aphids will remain present in the ground whence the roots were taken, and this ground should, therefore, be allowed to remain unoccupied for some months, or planted to other stock than the peach. In either case the aphids would succumb to starvation, for they are not known to feed on other plants than the peach, "except rarely the plum." In the few cases that have come under my observation where plum trees were infested, no root forms were found and the trees recovered from the attack in a few weeks. This is accounted for by the fact that these infested plum trees were growing on other than peach roots. It should be borne in mind that if the plum is growing on a peach root it is possible that root infestation may follow.

So much, then, for the actual presence in our State of the black peach aphis, and to us remains the solution of the problem of its practical control.

WHAT HORTICULTURAL COMMISSIONS HAVE DONE FOR CALIFORNIA.

By J. W. JEFFREY,
Horticultural Commissioner, Los Angeles County.

Agreeable to the request of the Secretary of the State Board of Horticulture, I shall attempt to set forth some account of the work of the Horticultural Commissions of Southern California during the past year. In this attempt I can not speak in detail of the work of other counties than that of Los Angeles, as the enactment under which the County Horticultural Commissions operate makes no provision for co-operation and the interchange of intelligence between the County Boards. A remedy for this deficiency has been attempted in the State organization of Commissioners, which holds annual meetings in connection with the State Fruit-Growers' Convention. Having been in office only one year, I am not as familiar with the achievements of the State association as some of the older members, but it is no doubt doing much to forward the work of the individual Commissioners throughout the State. In the southern end of the State we have a similar organization, called the Association of Horticultural Commissioners of Southern California, which has been holding semi-annual meetings for several years. With the work of this association I am familiar, and I believe it has been a strong factor in unifying the service in the southern counties, and inspiring the Commissioners to do more effective work. As an example of the matters treated at these meetings, the following are the rules passed at Riverside recently by the Commissioners of the seven southern counties in their efforts to make uniform the treatment of trees and plants offered for shipment in this district:

First—All shipments of nursery stock must be accompanied by a certificate attached to each package, signed by an inspector or commissioner, certifying that the shipments are free from insect infection, whether they be to points within the county in which the inspection is made, or to points in other counties.

Second—Railroad and other freight offices, and all carriers, must not accept nursery stock for shipment, unless a tag certificate is attached thereto, attesting that the consignment is free from insect and other infection, and signed by the authority of the Horticultural Commission.

Third—All nurserymen, tree-dealers, and florists in each county are hereby prohibited from purchasing or receiving for sale, on commission or otherwise, any kind of nursery or florists' stock, unless the same is accompanied by a tag certificate, or certificate of general cleanliness of stock, issued by order of the County Horticultural Commission in accordance with the preceding rules.

Fourth—No certificate of disinfection or cleanliness of nursery stock shall be issued by any commissioner or inspector unless, upon thorough inspection, such stock is found free from insect pests of every character. This is understood to mean that no certificates are issued upon the mere fact that the trees have been disinfected.

Fifth—That it is necessary to destroy all insect pests before the trees are taken out of the nursery.

In their efforts to devise a plan of inter-county co-operation, the Commissioners have been only partially successful, as each Commission has its own duties, and time has become the element to be considered in this phase of the service. I believe the Supervisors would be acting within the spirit of the law should they provide for and make it one of the requirements of the horticultural office to maintain a system of inter-county work between the Horticultural Boards of the State. While I am unable to speak of the administration of other counties, the work in Los Angeles County may be taken as typical, and I may be able also to give this convention a clearer idea of the state of horticultural affairs in one of the principal fruit counties of California.

In answering the question, "What have the Horticultural Commissioners done ?" an optimistic answer is no doubt expected from one of them, and yet one would not expect any Commissioner in fair repute to set forth other than the truth to a convention of such intelligence, and such opportunities for verification should he seem over-sanguine in his views of the achievements of his office. With this in view, I do not hesitate to say that an active, capable Horticultural Commission is of paramount importance to the fruit interests of the county. Its opportunities for good are almost unlimited. The range of subjects that properly come before the office in carrying out the plain instructions of the law is far greater than is realized by those unacquainted with the office. Briefly, the law requires the inspection and disinfection of trees, plants, vegetables, packing-houses, and salesrooms, and other places where plants or fruit are kept; provides for the division of the county into districts, and the appointment of local inspectors; requires the keeping of records, and the filing of reports with the State Board, and the Board of Supervisors. These requirements are but general directions, in the fulfillment of which the range of work is most intricate and exacting, and only limited by the diligence and working capacity of each Board of Commissioners.

In attempting to carry out the intent of the law, for example, the Los Angeles County Commissioners within the last year organized the apple-growers of the county for the purpose of making a united effort in combating the insect pests affecting the apple, believing the work would be furthered far better in this distinctly co-operative way than otherwise. The association of apple-men has held a meeting about every two months since its formation over a year ago, in conjunction with the members of the Horticultural Commission and the inspectors of the districts. At these meetings, held at three points in the apple country, the room has been turned into a display of charts, bulletins, specimens of insect infection and fungous disease, together with appliances and formulas for fighting all forms of infection peculiar to the apple. The association has had a working committee in each locality gathering data upon the blooming time of the different varieties of the apple, the pollinating effects of varieties upon each other, the effect of spraying upon fruit foliage and insect life, to determine which minute details have been observed, even to the counting of the number of infested apples upon trees treated with different sprays, one, two, three, or four times—in short, every detail of soil, cultivation, disinfection, and harvesting, has been studied with a view to determining the most effective methods of fighting insect pests and disease, that the apple industry of the county may be restored to a profitable basis. The data thus gathered from the entire field will be published by the Board of Commissioners. I consider this a success in furthering the work prescribed by the horticultural law.

Another phase of the work of our Commission is the organization of the nurserymen and florists of the county for the purpose of establishing clean nurseries and greenhouses in every district. The members of the Commission are members of this organization and meet with the association of evenings to discuss methods of exterminating insect pests, preventing re-infection, and maintaining better conditions in every way. The result, together with the rules enforced in the transportation of trees, has been very beneficial, bringing a majority of the nurseries into fine condition. One inspector's report shows that he inspected 19,608 trees and plants in November. Of these, only 283 trees were found infested with insect pests, and I can assure the convention that the inspection was thoroughly done.

In the administration of the office of the Horticultural Commission, the Los Angeles Board has a meeting of the inspectors of the county every month. This plan is not in operation, perhaps, in any other county. It presents the work in a new phase. I will give in detail the work of these inspectors' meetings, as they are the most effective means we have yet attempted of gathering data upon the horticultural conditions of the county, acquainting the Board and inspectors with the details of the work, becoming acquainted with the best methods of combating insect pests, and securing good service throughout the districts. One week before each meeting, which is held the first Saturday each month, every inspector must file a report of the work done in his district during the month. From these reports the secretary writes a review, presenting every point in the reports which he thinks of sufficient importance to require the official notice of the Board. This review usually covers about twenty pages, each item being numbered and accredited to the report from which the item is taken. When the inspectors and Commissioners are in session this review is read and discussed. Every item of the review is acted upon by the Board, and the conclusion, under proper number, recorded in the minutes of the Board. The only disadvantage of this plan is that the inspectors are compelled to bear their own expenses in attending the meetings, but we find them so interested in the work that we have not had one absentee during the year. As Los Angeles County has an average of about nine inspectors constantly employed, these meetings bring together a good number of representative men, and I consider this scheme one of the most potent factors for good which has been set on foot by our Board during the year. As the two field members of the Board have charge of the districts of the county not provided with inspectors, these Commissioners are required to furnish reports upon these districts, which reports are placed under discussion as a part of the review.

I shall attempt to give the members of this convention a clearer idea of the scope of the work undertaken under the horticultural law by quoting a number of subjects considered and passed upon by the Los Angeles County Board during the year:

The examination of the vineyards of the county for Anaheim disease, phylloxera, and fungous disease; the condition of citrus fruit orchards planted from nursery trees known to be absolutely clean when set in orchard form, the examination to determine the value to the planter of perfect nursery disinfection; the initiation of a joint study of the life history of the red spider, conducted by the State University and the Board of Commissioners; co-operation with the State Board of Horticulture in the distribution and care of parasitic insects; the general destruction of abandoned orchards upon city lots and suburban property through compulsory notice to disinfect, usually followed by removal of the trees; the campaign for the disinfection of packing-houses throughout the county, requiring the inspection of each house, and the destruction of fungous diseases by fumigation; a crusade for the removal of shade trees liable to insect infection and distribution, and the organization of a society devoted to the dissemination of information upon street and roadside trees, with a view to planting only varieties free from insect pests; the supervision of the work of fumigation and spraying, and efforts to have all contracts for orchard disinfection drawn with a provision making payment for services contingent upon the approval of the work by the Board; the installation of fumigating rooms in the nursery and greenhouses of the county; the testing of the law as to the destruction of trees infected with walnut disease, blight, and other forms of bacterial disease; the systematic and permanent plotting of orchards; the extermination of Russian thistle and other noxious weeds through the office of the Commissioners, and many other features relating to the administration of the laws that were passed upon during the year by the Commission.

In treating of what the Commissioners have done for Southern California generally we must take into consideration the fact that many extensive localities are particularly afflicted with the black scale, the only orchard pest, except the codling-moth, that seems beyond extermination. In dealing broadly with this, the Commissioners have struck at the root of the trouble by attempting to make absolutely clean the propagating establishments of the district. To secure this in Los Angeles County the present Board first disinfected the nursery and greenhouse surroundings by the application of the compulsory features of the law.

The introduction of the purple scale from Florida a dozen years ago has caused the loss of hundreds of thousands of dollars, though the scale has never gained footing in any of the citrus-growing centers of the county. The Commission has, during the past year, plotted every orchard containing one or more trees infested with this scale; has treated every tree with cyanide or distillate, exterminated the scale in a large number of orchards, and has the infection under control, with no probability of its extension to new localities. The Board has also caused the enactment of an ordinance by the Board of Supervisors prohibiting absolutely the importation of Florida stock under provisions that we are sure are constitutional, and which is in force to the letter.

In conclusion, when we attempt to set forth the benefits of supervision under the county horticultural law, it is proper to consider what the conditions of the orchards of Southern California would be without the constant efforts of the Horticultural Board.

Without this, the purple scale, for example, would long since have overrun the most productive districts of the coast foothills.

Incentive to the work of the individual orchardist would have been removed through the impossibility of enforcing the cleaning-up of individual orchards. There would be no check to the distribution of pests in new districts or new orchards through nursery infection. It would be impossible for the State quarantine office to secure the best results without the co-operation of the Horticultural Commissions, and other departments of the State Board of Horticulture could not succeed fully without the concurrent efforts of these Boards. I believe in every case where the Supervisors of the southern counties give the Horticultural Commissioners due support, and the Commission renders intelligent and continued service, the fruit-growers are in full sympathy with the work of the office. In the words of one of the most prominent horticulturists of Los Angeles County last September, in relation to the distribution of parasitic insects: "Steps should be taken to keep the public at large, and especially our lawmakers, informed of the great value of the work of our entomologists, as they make it clear that we have no expenditure in our State and county system that pays such large dividends. Therefore, they ought to be liberally sustained."

DESTRUCTION OF BENEFICIAL BIRDS.

By W. OTTO EMERSON, of Haywards.

How true is the statement of E. Seton-Thompson that "the life of a wild animal always has a tragic end."

In all the ages we find that birds have played an important part in the life of man and in the surroundings of the human race. In early Egyptian times birds were held in great veneration, and many were set up in the temples and their images adored for the supposed protection it was thought they could give the worshiper. Among the birds most venerated by the Egyptians were the sacred ibis and the owl. Among the ancient Romans, birds entered largely into the religious life, and the manner of flight, or the position of their entrails when slaughtered, were interpreted for good or bad by the pagan priests. Even among our native Indian tribes birds have been regarded as being ominous of good or ill.

Civilized man takes a more practical view of bird life, and its destruction in farm or orchard must necessarily interest us more and more as our crops—fruit, seeds, and vegetables—are attacked by new pests. This is especially noticeable at the present time when calls are constantly being made on our experts in entomology to look into pests that are breaking out in different parts of the State, and to supply remedies or preventives for the different insect scourges which are continually attacking the leaves, roots, or fruit of the producing districts of the land. Experts in ornithology are co-operating with the entomologists in their labor in most of our universities, while the horticultural departments and boards of horticulture are all working to the same end—the preservation of our crops from our insect enemies—and in line with this work investigating the benefits derived from the different species of birds from all sections of the country, studying their foods, habits, and methods, in farm and orchard, and even in the wilderness.

The destruction of beneficial birds is moving along in three principal lines: the elements, wild animals, and the hand of man. This destruction at the hand of man is for three purposes: adornment, food, and scientific investigations, and the destruction is greatest in the order named.

A bird's life at the most does not range over five to fifteen years. Those of the order *Anseres raptores* and some of the pelagic forms live many years. The causes of destruction by storms or the elements on land or water are not noticeable in the diminishing of great numbers from any sections of the country, in comparison with the trap or gun of man. Many are killed by storms and by coming in contact with the light stations of the sea coasts, where they are attracted, like moths, to their death, by the blinding rays of light. Many are also killed by striking against the overhead wires, tall towers and spires of the thickly settled cities. They become confused by these unnatural objects in their migrating northward to the summer home or southward to the winter home, and so the destruction by these tall objects and lights amounts to many hundreds during the nights of the migrating season. Others are driven far off shore to perish at sea.

Only a few, comparatively, are destroyed by wild animals, as the weasel, coon, fox, wild cat, and one or two species of owl and hawk, which prey, in part, upon bird life for their food.

The hunter kills thousands where the elements and animals destroy only tens.

In many States most admirable laws are being framed to stop the market and plume hunters from carrying on the wholesale destruction of bird life. A walk through any of the large markets of our large cities will show us the results of the trap, net, and gun. Well spread before the eye are hundreds of featherless birds, skewered by dozens on willow switches or sticks, at from thirty to fifty cents a dozen; and this shooting and netting of birds is carried on the year around, excepting in the case of the robin and meadowlark, and those game birds protected by law. A few countries are trying to enforce ordinances for the protection of some song birds.

In examining the birds exposed for sale at the market-stalls many beneficial species will be seen: three varieties of goldfinches (*Spinus*), two *Melospiza*, a *Pipilo*, hundreds of pipits (*Anthus*), some of the horned larks (*Otocores*) shot in large numbers, four varieties of the family *Sturnidæ*, besides many species of small shore birds. If we ask the salesman for reed-birds, he will give us any of them, as they all go under that name, although the reed-bird is known on the Atlantic coast as bobolink (*Dolichonyx oryzivorus*).

The market hunting-grounds are the surrounding bay counties, but many hunters are now found up the river valleys, where they have more liberty in their noxious trade. Along the river banks and brushy sloughs may be seen the mode of taking birds by spreading fish-nets over the low bushes, where several hundred birds will be taken at a setting. Two thousand birds is not an unusual day's trapping, by this means. Nothing can escape the net. More birds can be destroyed in one day by this means than a man with a gun could get in a week's shooting. It will now be seen how the diminishing of bird life is going on in this one instance.

The hunting of birds for the millinery trade outnumbers all the other means we have so far mentioned. For this purpose the slaughtering of our feathered tenants goes on regardless of kinds, from a wren to a pelican. All can be made use of, by coloring, for purposes of adornment. From a circular letter which came into my hands last January I learned of a go-between in Oakland who was connected with a sale of forty thousand bird-skins shipped to an Eastern plume-house. I was addressed on the subject of a market to be had for wings, breasts, and skins generally, of eagles, hawks, owls, gulls, terns, grebes, and, in fact, any bright-colored birds that would do for the shape.

Plume-hunters are to be found all along our mountain lake borders as soon as the nesting season begins, collecting what may come to the lake for the reproduction of their kind. When the hunter has cleaned out the vicinity, he moves to another, taking in the whole gamut of lakes from California to Washington. In the everglades of Florida and bayous of Texas outfits of steam launches and sloops are sent to collect the nesting birds. In many sections species have become exterminated, where formerly they were bringing up their young by thousands, and these, old and young, would later on have spread all over the continent, doing good by keeping down the countless numbers of noxious insects and small destructive animals.

The great record of one hunter in Florida is a disgrace to any man, killing in a single season 141,000 birds. A few years ago an order was sent to this Coast for ten thousand water-birds' wings and breasts, which were collected from nearby bay shores, there being more than five men employed for the winter. This destruction of vast numbers of birds must necessarily mean an increase of insect pests, which will require more vigilant care and a vastly greater expenditure of money on the part of the husbandman in protecting his crops. Wherever we see vegetable life weakened by insects feeding upon it, other ills, such as fungous growths, smuts, and scale, more readily take hold of the tree or shrub and soon spread disastrous results to the fruits.

The following list of useful birds is described as beneficial. There are many others that could be added that the layman would not be so familiar with as those named. Seven species are named as not worthy of protection:

BIRDS USEFUL TO FARM AND ORCHARD.

Common Name.	*Scientific Name.*	*Character of Food.*
Marsh Hawk	Circus hudsonius	Small mammals, insects, reptiles.
Western Red-tail Hawk	Buteo borealis calurus	Squirrels, field mice, grasshoppers.
Red-bellied Hawk	Buteo lineatus elegans	Squirrels, field mice, grasshoppers.
Swainson's Hawk	Buteo swainsoni	Grasshoppers, crickets, and mice.
Rough-legged Hawk	Archibuteo ferrugineus	Grasshoppers, crickets, and mice.
Pigeon Hawk	Falco columbarius	Crickets, field mice, grasshoppers.
Desert Sparrow Hawk	Falco sparverius deserticolus	Crickets, field mice, grasshoppers.
Barn Owl	Strix pratincola	Gophers, rats, mice, shrews, frogs.
Barred Owl	Syrimum nebulosum	Gophers, rats, mice, shrews, frogs.
Short-eared Owl	Asio accipitrinus	Gophers, rats, mice, shrews, frogs.
Long-eared Owl	Asio wilsonianus	Small mammals and frogs.
California Screech Owl	Megascops asio benderei	Mice, beetles, and grasshoppers.
California Pygmy Owl	G. gnoma californiacum	Mice, beetles, and grasshoppers.
Burrowing Owl	S. cunicularia hypogæa	Mice, crickets, grasshoppers, and beetles.
Cabanis's Woodpecker	Dryobates villosus hyloscopus	Wood-boring larvæ and insects.
Gairdner's Woodpecker	Dryobates pubesceus gairdnerii	Wood-boring larvæ and insects.
Nuttall's Woodpecker	Dryobates nuttallii	Wood-boring larvæ and insects.
California Woodpecker	M. formicivorus bairdi	Wood-boring larvæ and insects.
Red-shafted Flicker	Colaptes cafer collaris	Codling-moth, larvæ, and ants.
Arkansas Kingbird	Tyrannus verticalis	Injurious insects of all kinds.
Ash-throated Flycatcher	Myiarchus cinerasceus	Noxious insects, moths, larvæ.
Say's Phœbe	Sayornis saya	Noxious insects, moths, larvæ.
Black Phœbe	Sayornis nigricans	Noxious insects, moths, larvæ.
Western Wood-Pewee	Contopus richardsonii	Noxious insects, moths, larvæ.
Western Flycatcher	Empidonax difficilis	Noxious insects, moths, larvæ.
Mexican Horned Lark	Otocoris alpestris chrysolacum	Insects and seeds of noxious weeds

BIRDS USEFUL TO FARM AND ORCHARD—Continued.

Common Name.	*Scientific Name.*	*Character of Food.*
Arizona Hooded Oriole	Icterus cuculatus nelsoni	Caterpillars, wire-worms.
Bullock's Oriole	Icterus bullocki	Larvæ of noxious insects and army-worms.
Western Meadowlark	Sturnella magna neglecta	Beetles, grasshoppers, wire-worms, and crickets.
Arkansas Goldfinch	Astragalinus psaltria	Scale, aphis, and noxious weed seeds.
Western Chipping Sparrow	Spizella socialis arizonæ	Ants, spiders, seeds, spring and fall.
Oregon Junco	Junco hymenalis oregonus	Noxious weed seeds, spring and winter.
Samuel's Song Sparrow	Melospiza cinerea samuelis	Injurious insects of winter and spring.
California Towhee	Pipilo fuscus crissalis	Weed seeds and larvæ of injurious insects.
Black-headed Grosbeak	Habia melanocephala	Wire-worms, corn-worms, and beetles.
Lazuli Bunting	Passerina amœna	Summer insects and noxious weed [seeds.
California Shrike	L. ludovicianus excubitorides	Crickets, grasshoppers, beetles.
Western Warbling Vireo	Vireo gilvus swainsoni	Injurious insects and larvæ.
Vigor's Wren	Thryothorus bewickii spilurus	Tree spiders and larvæ.
Western House Wren	Troglodytes ædon aztecus	Spiders, bugs, and caterpillars.
Plain Titmouse	Parus inornatus	Injurious larvæ and tree bugs.
California Bush Tit	Psaltriparus minimus californicus	Scale, bark lice, minute insect eggs
Russet-backed Thrush	Hylocichla ustulata	Spiders, beetles, ground insects.
Western Robin	Merula migratoria propinqua	All kinds of earth-worms.
Western Bluebird	Sialia mexicana occidentalis	Caterpillars. spiders, grasshoppers

BIRDS NOT WORTHY OF PROTECTION.

Sharp-shinned Hawk	Accipiter velox	Young poultry, small birds.
Cooper's Hawk	Accipiter cooperi	Game birds, and small insectivorous birds.
Duck Hawk	Falco peregrinus anatum	Game and insectivorous birds.
Red-breasted Woodpecker	Sphyrapicus ruber	Girdling trees with rings of holes.
California Jay	Aphelocoma californica	Destroys insectivorous bird-nests [and fruit.
House Finch	Carpodacus mexicanus frontalis	Destroys fruits and blossoms.
English Sparrow	Passer domesticus	Feeds on grain, fruit, buds, and blossoms.

THE SAN FRANCISCO MARKET.

The following committee report was submitted to the convention:

To the State Convention of Fruit-Growers of California:

GENTLEMEN: Your committee to whom was referred the state of the San Francisco market, with instructions to proceed to organize upon the plan reported to the last State Convention of Fruit-Growers, beg leave to make the following report:

We started the work of organization first upon the Sacramento River, because that was the chief section from which perishable products are shipped to the San Francisco market. It was late in the season before an organization of the Sacramento River growers could be secured, and while it was proposed that this organization should be but one of several that should be centralized for the conduct of co-operative marketing in San Francisco, the season had already become so late that if anything was to be done during the summer of 1902, it was clearly evident the Sacramento growers would have to take the lead. This they did and proceeded to rent a store and equip it for business. A large number of the heaviest growers on the Sacramento River were included in this organization, and shipped very freely to it. The membership of the California Fresh Fruit Exchange from the various sections where associations are established also shipped to this house, which was known as the "Growers' Co-operative Agency." The business was entirely satisfactory and giving an excellent profit until somewhat past mid-season, when the action of the San Francisco commission merchants put in force a boycott, which rendered it exceedingly difficult for the Growers' Co-operative Agency to do business. Of course, it is well known that while responsibility for the boycott is difficult to fix, its effects may be clearly traced. The retailers and peddlers were instructed that they would be unable to buy any supplies of the members of the Commission Merchants Association if they did any business with the Growers' Co-operative Agency. This extended even to dealers at San José, and other points. A suit has been brought which is now before the State courts, to secure a withdrawal of the boycott and for damages resulting from it.

At various times the growers have endeavored to secure of the commission merchants permission to do a co-operative business for themselves in the San Francisco market, but this has been in each instance refused and met with the declaration that it would be necessary for the growers to disincorporate and refuse entirely to do business upon the co-operative plan, or they would not be permitted to sell their own wares in San Francisco. In the opinion of your committee, no other resource is left to the growers of California, who ship to the San Francisco market, than to extend the work of organizing local associations, and centralize these into an organization which shall conduct the business of selling perishable products in the San Francisco market. They would also recommend that the present law providing for a free market be made effective, and provision be made for opening the same without delay.

Respectfully submitted.

A. R. SPRAGUE,
Chairman of Committee.

The following resolutions were also submitted to the convention:

WHEREAS, The fruit-growers of the Sacramento River district have organized a co-operative marketing agency for the purpose of defending themselves from the extortions of the organized commission merchants of San Francisco; and,

WHEREAS, The said organized commission merchants have used every means in their power to break up and destroy the said Fruit-Growers' Co-operative Marketing Agency; and,

WHEREAS, The said agency is in need of assistance; therefore, be it

Resolved, That it is the sense of the members of the Newcastle Fruit-Growers' Association, in annual meeting assembled, that it is the duty of every fruit-grower and of every horticultural organization in California to give to the said Fruit-Growers' Co-operative Agency the strongest support possible; and be it further

Resolved, That we urge this matter most earnestly upon the attention of the convention of the State Horticultural Society, to be held in San Francisco during the first week of December.

NEWCASTLE FRUIT-GROWERS' ASSOCIATION,
By G. GERALDSON, Secretary.

MR. REYNOLDS. As Mr. Sprague has already made a report of the Committee on Organization, I think it would be well for this convention to still let them go ahead and organize in other parts of the State, because it is absolutely necessary that the farmers should co-operate with one another in order to get prices for their fruit in San Francisco. I will give you a history of the trouble between the Sacramento co-operators and the commission merchants in San Francisco. As Mr. Sprague says, we have an organization on the Sacramento River, but owing to existing circumstances we did not get our business started in San Francisco as soon as we expected in the beginning. We were told we would not be allowed to do business unless we were a member of the Produce-Dealers' Association. We put in an application, through our representative, to join that body, and it has not been acted upon yet. When he reported this to me, I went to the president of the association and asked him, as a special favor, to give me an answer, and at a meeting eleven voted to admit us and sixteen voted against us. We also put in an application to join the Protective Association. We were turned down there also. In a very short time, in spite of the antipathy of the commission men, we commenced to do a very good business, and we began to get consignments from those residing at a distance. Then we were boycotted, and the boycott is still on. We were told by the commission men that they would do business with us if we would disincorporate and do business as individuals; but we contend that we have a right to come to San Francisco and do business in our own manner. On account of the boycott, our business is not paying expenses; but at a meeting held by those interested, we subscribed $2,000 for the purpose of keeping the store open, and we are going to keep it open. A number of the retailers have told us that they were willing to deal with us, but that we can not supply them with everything they need, and the commission men will not sell to them unless they refuse to buy of us; so it would be well if the producers of the different products would form local organizations, and come in with us, so that we may be able to supply the demand to a still greater extent, and each organization bear expenses and profits pro rata, and let one member of each organization be stationed in San Francisco to act as executive committee and run the business.

The convention adjourned until 1:30 o'clock P. M.

AFTERNOON SESSION—THIRD DAY.

THURSDAY, December 4, 1902.

The convention was called to order at 1:30 o'clock. Vice-President Wickson in the chair.

VICE-PRESIDENT WICKSON. One of the most delightful and edifying features of the last session of this convention was that portion of it devoted to what was called the Women's Meeting. If you remember, we had a list of very entertaining essays and addresses, and we all felt that the setting apart of a portion of the time for the women's proceedings was a good thing. Acting on such experience, the same provision has been made this year, and the time has now arrived to take up that part of the convention.

AIMS OF WOMEN'S AGRICULTURAL AND HORTICULTURAL UNION OF CALIFORNIA.

BY MRS. MARDEN, OF FOWLER.

The Women's Agricultural and Horticultural Union was formed at the time the International Convention of Women was held in London, 1899. Through a suggestion made by a California delegate, Mrs. Emma Shafter-Howard, the countries represented there pledged themselves to organize unions. The English and Canadian women have strong unions; Belgium has organized also. It was at the Fruit-Growers' Convention held in San Francisco in December, 1900, that the Women's Agricultural and Horticultural Union of California was organized. As yet not much has been done beyond the increased membership and assistance in the program of the Fruit-Growers' Convention last year and this. We hope to be doing great things very soon, for every member of the Union is seeking that higher education in practical and social tendencies. We hope to have a bureau of information and exchange to enlighten us on the methods of different countries in the agricultural work of women; to publish to the world the advantages and inducements to home-making people to come to our State, in increasing numbers, for suburban life. When we have learned to economize our labor, and the women's work on the farm ceases to be drudgery, and they are found happy and more contented in their country homes, will not the young woman who aspires for city life take greater interest in her employment in the country, where she is so often needed to assist and where it is almost impossible to keep her? When women of the cities become more intelligent in agriculture there will be a closer bond of interest between city and country, and both will be greatly benefited. If country life could be made more attractive to the women, the men would be found there more often. Then rural exodus would not cause so much apprehension. If the farmer's wife would take up this practical education, she would be a better partner for her husband. She could care for the small holdings on the farm that he so often overlooks. She could discuss the business with him in an intelligent manner, and then both should decide the problems, which all partners in life ought to do.

The first object of the Women's Agricultural and Horticultural Union is to form a bond between women, in all countries, who are engaged, whether directly or indirectly, as employers or employed, or as working amateurs, in farming, dairying, poultry-keeping, or bee-keeping; in fruit or flower-growing for profit; in landscape gardening, forestry, or the management of estates.

Second, to circulate useful information and to compare the methods of different countries and districts.

Third, to advise as to training, and to make known openings for obtaining employment, and for the disposal of produce. Members can also consult each other; for example, one intending to settle in Canada could write to a member there, and get information at first hand.

Fourth, to endeavor to secure an adequate rate of payment for women employed in any of the indicated lines of work. To uphold the highest standard of work.

You will see that the duties of this Union are many, and should it take a long time to perform them all, every effort that is made will be of great good to those who are interested.

MR. DORE, of Fresno. Has any effort been made or considered by the ladies in the matter of forming local unions in the different parts of the State, and of taking up the same lines of work that have been outlined in the paper just read? I would like to ask whether it would not be advantageous, and be a feeder to the great State organization, to have them. Many are not permitted to participate in these gatherings, but if such organizations were formed throughout the State many more ladies who are not able to attend here, would reap a benefit thereby.

PROFESSOR WICKSON. I think it is part of the plan to secure local organizations for just such purposes as Mr. Dore has mentioned.

MRS. MARDEN. For information regarding that I would refer you to our President, Mrs. Sherman.

MRS. SHERMAN. We have tried to form such organizations, and I believe now that there are several counties that have taken hold of that work. We have tried to get the information out to them through the California Federation of Women's Clubs, and in that way make our work known throughout the country.

MRS. BORRETTE, of Napa. As a member of a subordinate grange I have attended a number of sessions of the State Grange, and I would recommend that they communicate with the secretaries of all the subordinate granges throughout the country, and I think in that way you can get a more hearty response than from any other source, as many of the ladies are already organized throughout the country.

Mrs. O. E. Borrette then read the following essay by Mrs. Rhea, of West Park:

THE COW.

By LAURA W. RHEA, of West Park.

There is nothing that deserves the support of the farmer so much as the cattle business, and it will do more to add to the wealth of the country than many more pretentious business enterprises which engross much of the public attention. The farmers and wage-earners of this country are the real capitalists. If the farmer and wage-earner are prosperous, it is absolutely certain that all others will be prosperous, too, and our people as a whole will profit, for successful home-making is but another name for the upbuilding of the nation.

One third of the area of this country, or eight hundred and forty-one millions of acres, is devoted to agriculture. There are to-day over five millions of farms in the United States, one million of which have been established in the West within the last ten years. There are still three hundred and six millions of acres of unsettled lands now ready for occupation. This increase in the settlement of our country is rapidly doing away with the vast cattle ranges. The cowboy has passed into history, and "round-ups" are no longer important events.

Only a few years ago vast portions of Texas, Colorado, and Kansas, and of other Western States, were vast cattle ranges and many thousands of cattle were shipped to various parts of the country. Their owners were the wealthiest people of the land, and many of them were veritable cattle kings.

But these times have changed. Many of the ranges have been reduced to farms; more people have found employment in raising feed and in the production of cattle. The profits have been more equally distributed among the people. Dairies have been established to supply milk for cities and towns, creameries to manufacture our butter and cheese, and the old-time churn has gone to keep company with the spinning-wheels of our grandmothers. State dairy schools have been established to study the best methods of producing and caring for cattle, and thus place the dairying business upon a scientific basis. Cattle are now better fed and cared for than they were in the days of the ranges, when they roamed about at will with no attention paid to their feed, or without protection from the storms and blizzards which annually destroyed many thousands.

The bicycle, automobile, and electric cars have largely taken the place of the horse. But the cow is constantly increasing in value, and each year there is a greater demand for her product. She may truthfully be called the queen of animals.

California is the banner State for the production of fruits, figs, olives, oranges, and raisins. But we export more of these than is consumed at home, because they are luxuries. Fresno, the great raisin center of the State, has already received this season more than $2,000,000 for raisins alone. But the number of dairies and creameries is constantly increasing, and the increase in the number of cattle is far in excess of the increase in acreage planted to fruits and vines.

A few years ago the visitor to our colonies would find here and there a cow staked out on the ranch, and occasionally a farmer's wife would be brave enough to take a few pounds of butter to market. Our dealers were further supplied with "coast butter." Fresno's market is now supplied from her own creameries, and many thousand pounds of butter are monthly shipped to San Francisco and our new possessions.

To take away the creameries from our midst, and to stop the milk wagons from carrying the product of our cows, would be a greater loss to our people than the uprooting of all of our trees and vines. Every day in the year thousands of pounds of milk are taken to the creameries, and every month the farmer receives his pay.

We can truly say that the following tribute rightfully belongs to the cow:

"No other animal is so preëminently practical as the cow. Of all God's animal gifts to man she is the greatest. To her we owe the most. Examine into all the different ramifications and channels of commerce into which she enters, and note the result should she be blotted out. A Sunday stillness would then pervade the great stockyard industries of our large cities, and grass would grow in the streets. Seventy-five per cent of the great freight trains that cross the continent would be sidetracked, for there would be nothing for them to do. Fully fifty per cent of the laborers of America would draw no pay on Saturday night, and our tables would be bare of the greatest necessaries with which they are now loaded. She has made the great Western plains to blossom, financially, like the rose. The great city of Chicago, which was scarcely known fifty years ago, now contains two hundred thousand more people than the State of California. Her stockyard industries contribute largely to this rapid growth, and her neighboring city, Elgin, is noted the world over for its fine butter and creameries. St. Louis, Kansas City, Omaha, and Cheyenne owe their greatest wealth to her product. The last named city boasts of more millionaires than any other city of its size, all of whom made their wealth in the cattle business.

"There is not a part of her but what is utilized by man. We use her horns to comb our hair; her hair keeps the plaster on our walls; her skin is on our feet and on our horses' backs. Her hoofs are made into glue. She gives us our milk, our cream, our butter, and cheese. Her flesh is the food of all nations. Her blood is used to make our sugar white, and her bones, when ground, make the greatest fertilizer, and in her paunch she herself has put through the first process for the manufacture of the best white board paper, and it has been discovered that *that* paper is the most lasting material for the manufacture of false teeth.

"No other animal works for man both day and night. By day she gathers her food, and while we are asleep at night she brings it back to re-chew and manufacture into all of these things of which I speak.

"She has gone with man from Plymouth Rock to the setting sun. It was her sons that broke the first sod in the settler's clearing; it was her sons that drew the prairie schooners for the sturdy pioneers across the trackless plains, as inch by inch they fought to prove that 'Westward the star of empire takes its way,' and the old cow grazed along behind, and when the day's march was done she came and gave the milk to the babe that was perchance to become the future ruler of his country."

Who says that what we are we do not owe to man's best friend, the cow?

The following essay on "Drainage," by Miss L. N. Hatch, of Fresno, was then read by Mrs. E. P. McCallum:

DRAINAGE.

BY MISS L. N. HATCH, OF FRESNO.

As is well known, the conditions of soil and climate of Fresno and her surrounding colonies are admirably adapted to fruit-growing, and fruit-growing of so large a variety that not only is every want supplied, but also nearly every luxury. The soil is of great depth, very porous, rich in potash, soda, and all essential elements of plant food, and though once considered a vast desert sand plain, has, by the application of water, been transformed into a land of plenty and has such fertility as produces vegetation of tropical luxuriance.

Our water-supply is from Kings River and is very pure, since it comes chiefly from the rain and melted snow. It has little chance of taking up salts in solution; but the salts or alkali dissolved from the soil by the water have come to the surface and accumulated in sufficient quantity to injure our vineyards and orchards.

When irrigation was commenced in the country around Fresno, ground water was found at a depth of from seventy to one hundred and fifty feet. At present, in the same country, water can be found during the irrigating season at from three to six feet from the surface, and in some places it stands on the surface. This rise of water, due to excessive irrigation and seepage, has deprived the roots of our vines and trees of sufficient depth of soil to promote growth. This nearness of underground water and the damage to the land from alkali are two emphatic reasons for a drainage system in our section of country, because drainage, and that alone, can restore fertility to alkaline soil.

A note of warning was sounded some twelve years ago, and had it been heeded—"Ah, me, what might have been!" But at that time the damage was slight, the vineyards and orchards were in full bearing, yielding abundant harvests, and prices for our crops were as good if not better than at any time since, consequently few realized the danger, and the warning passed unheeded.

Destruction moved on with rapid strides, until now nearly all fruit-growers are actually suffering from the wasting of their fruitful lands, and so the cry of what can be done to remove the evil of alkali is again heard in the land.

The present movement was started by a question from a woman at a Farmers' Institute held at West Park last February. Later on a representative meeting of property owners was called at the same place, at which it was resolved, unanimously, "That it is the sense of this meeting that a drainage district in and around West Park should be organized." A committee was then and there appointed to agitate the matter among the property owners, and to win their adherence to the plan. After consultation it was decided by the committee to work on a broader plan, to cover a wider territory, and to work on scientific principles. To accomplish this end an appeal was made to Professor Hilgard, Director of the Experiment Station at Berkeley. He in turn asked aid of the General Government, and because this is a matter of general interest to the public everywhere, Secretary Wilson, of the U. S. Department of Agriculture, urged before the Senate Committee a special appropriation for investigation in Fresno, saying "that in California and other States where irrigation is practiced it is becoming a serious question how to handle the soil so as to prevent an undue increase in alkali." A sufficient sum was granted for the work, and because the situation at Fresno enabled the Government to pursue investigations under most favorable circumstances, we have had investigators from the two co-ordinate branches of the same department of the Government—one from the Bureau of Soils and others from the office of Experiment Stations, United States Department of Agriculture, the latter taking up the whole drainage question, and viewing it from an engineering standpoint. During the past summer Mr. Meade sent here the expert, Prof. O. V. P. Stout, of Nebraska, who, with an able corps of surveyors, has done a large amount of work, and secured such data as are necessary to use in handling the drainage question intelligently. Mr. C. G. Elliott, a special expert of the Department of Agriculture, joined him, and from their united labors a plan for draining the alkali districts in the vicinity of Fresno has been perfected.

Mr. Elliott says: "The district for which plans have been prepared begins at Malaga on the east, and embraces Fresno and Central colonies, West Park, the Bank of California tract, and Union Colony. A part of this is not yet affected by alkali, but the nearness of the water to the surface endangers the vineyards and orchards. From the surveys and other data we think that the public drains should be constructed on east and west lines, one half mile apart, and that they should be from five to seven feet deep, in order to retain the water-level at the proper distance from the surface. The engineers recommend subdivisions comprising from 1,000 to 1,500 acres, and a separate drainage system for each subdivision. The drains are to converge at a pumping station, at which the water is to be lifted into the canals. It is estimated that the cost of putting in a first-class drainage system will not be more than from $12 to $14 an acre, including the laying of the tiling at a depth ranging from five to eight feet, and the pumping plant at a cost of $1200. The engineers are confident that if the drains are laid half a mile apart the intervening spaces can be sufficiently drained."

So far the matter has progressed most satisfactorily, and now it is left for our legislators to provide a law paternal enough to promote progress, and plain enough to stimulate the people interested to push on the work, and thus enable me, at your next session, to report the great good accomplished by a complete and perfect drainage system.

JOHN DORE, of Fresno. As this lady says in her essay, nine years ago this danger was realized and an alarm was sounded. It is true that she was the first person that I know of in Fresno County who raised that question at that early time, and it was at an address at a Farmers' Institute and before the Farmers' Club. These matters were then discussed, but a great many people had not suffered at that time as they have since. You may, perhaps, get the impression that alkali is the great question, but the fundamental proposition is that where the water has been used too lavishly the seepage has risen until it has destroyed the roots of the vines and trees. Instead of from eight to ten feet that the roots should have to run, it is now limited to from two to four feet—somewhere along there. In very much of that country the water is within two feet of the surface at certain times of the year, and the time when it is nearest the surface is the time when it does the most harm; it is at the time of the most irrigation, in the spring and summer. The water being so near has caused great damage in the way of chilling the roots, and has also forced up the alkali, which is doing great damage. Drainage is the fundamental principle. We have been remarkably successful in our appeals to the General Government for assistance in this matter. Last spring, at an institute in Fresno County, this question was raised, and during the time that has elapsed we have secured the aid of Professor Meade, who is at the head of the Irrigation Division of the U. S. Department of Agriculture. He has interviewed the people and addressed them in public meetings. There were also several other scientists who worked with Mr. Meade, and as a result, they have decided that the course we have pursued by drainage is the proper one. Engineers were brought from various sections of the nation and given instructions to report on this work, and they have completed their reports and have returned to the East. I am told that the plans are already on their way to Fresno, and they will be printed as a part of the work of the experiment stations of the Department of Agriculture. Now we come to the most serious proposition of all—that is, to unite the people to carry on this work. The Government has done its work well and truly and with dispatch, but the indifference and slowness of the people in uniting in a great enterprise that is going to cost them something, perhaps, makes it uncertain whether in the near future we can accomplish what we now desire to bring about. The lady who gives us this paper has been seriously injured, and many of the other farmers there are similarly injured, by the rise of the water and by the bringing of the alkali to the surface, and great praise should be given this lady here to-day, because, with her superior intelligence and culture, she has devoted much of her lifework to this question, and she has been the one who has consulted with these Government engineers and has given them much valuable information during the past nine years which has brought about the results thus far attained.

ALEXANDER GORDON. As I understand it, the experts have completed their report, but I don't understand what plans they have adopted on which to carry out their drainage operations.

MR. DORE. I will state that, as I understand it, we have to form districts and will have to vote a tax to do the work. In order to do this work I can see of no other way than to vote a tax on the property that is to be benefited by the drainage.

MR. GORDON. If this convention can do anything toward aiding legislation in behalf of this project, it would be a worthy act. From a lack of drainage, I have suffered much loss in my vineyard in Fresno County. To give you an idea of the extent of that loss I will say that I have one hundred and twenty acres of raisins not far from the city of Fresno, twenty acres of which are being affected by too much water. The receipts from that twenty acres are from $80 to $90 less per acre than from that portion of my ranch which is not affected by too much water. I think this convention would profit by passing some resolution encouraging legislation covering these matters, and tending toward assistance for us, and I make a motion that the Chair appoint a committee of three to frame resolutions for presentation to the next Legislature, or, I would say, have this committee prepare such resolutions and then submit them to this convention for presentation to the Legislature.

Mr. Dore seconded the motion, which was carried by the convention, and the Chair appointed the following committee: Alexander Gordon, Sacramento; John Dore, Fresno; Prof. E. J. Wickson, University of California.

The following essay on "Turkey-Raising," by Mrs. W. H. Voice, of Fresno, was read by Mrs. F. P. Gage:

MY FIRST EXPERIENCE IN RAISING TURKEYS.

BY MRS. W. H. VOICE, OF FRESNO.

We moved to our Fowler home in 1901, a bare and destitute-looking place. The first thought that came to me was, what could I best do to help and beautify our home. So I have chosen the work of raising turkeys. I bought fourteen hens and a gobbler. The hens began laying in March, and in April I began to set them; I would set as many hens at one time as I could, and then give the little turkeys to one or two hens. If the mother was kind and gentle, I would give her as many as thirty-five turkeys. The next thing was to care for them. I began by keeping them warm and dry, feeding a good many times a day, but just a little at a time.

With my fourteen hens I hatched out one hundred and eighty-five turkeys. Out of the one hundred and eighty-five I raised one hundred and sixty-five.

With my experience in raising turkeys I find some things very unpleasant—especially in a rainstorm, when it is all rush and hurry to get them under shelter before they get wet. I will only mention one more of the unpleasant things. It is when the train is coming quite near and your flock is on the track, and then it is a race for their lives. It is not very often that we can run faster than a train, so we often lose them in that way.

Turkey hens attain maturity much earlier than gobblers. At two years hens will be full grown; they very seldom become larger after that time. Gobblers are not nearly matured at that age, but continue to grow until four or five years old. They are, however, in their prime breeding condition at three years old. Gobblers of this age mated to hens two years old will produce the finest and largest and earliest-matured turkeys.

Turkeys are very tender when young and must not be subjected to dampness or allowed to run in wet grass. At first feed bread thoroughly soaked in sweet milk, also give hard-boiled eggs mashed up and mixed with bread and milk. Feed at least five or six times a day, just a little at a time; after two weeks feed them curds and continue until eight weeks old. Turkeys must be liberally fed, and after they are safely through the critical period of their lives will gain in size very rapidly. They should be fed on stimulating food during the molting season, on account of the wonderful change they then undergo.

No farm stock pays higher or surer returns for the capital and time invested than turkeys, yet they are often very poorly managed and the profits are consequently meager. Great care must always be taken in the selection of the breeding birds. Those that grow fastest and largest and are the most perfectly formed should be retained for breeders. In a few years the increase in the average size and value of the flock will be so apparent as to convince the farmer that this is beyond all doubt the only right way and by far the most profitable. We can not too strongly urge this upon our readers. Turkeys are sure of being improved or degenerated, by the manner in which they are bred and selected.

OUR FORESTS.

By MRS. J. G. LEMMON, of Oakland,

Chairman of the Forestry Committee of the California Federation of Women's Clubs.

In the brief time allotted to the subject—"Our Forests"—I shall cite a few facts in proof of nature's lavish gift to the Pacific Slope, and particularly the matchless endowment pertaining to California, a narrow strip of country, as you know, 800 miles long by 150 miles wide, yet containing as many different kinds of pines alone as all Europe and Asia (Eurasia).

Our forests possess more kinds or species of resinous-wooded, narrow or needle-leaved, cone-bearing trees than any equal area on the rest of this earth. They are either the largest in dimensions or they bear the largest fruits, called cones, that the earth has produced. All these matchless, superlative qualities have been given so richly through the generous forces of nature as to suggest a special local favor.

It may be of interest to call attention to some facts substantiating the enumeration of gifts. Three of our pines, the great sugar, yellow, and Jeffrey pines—all very valuable as timber trees—are the largest and tallest of the family of pines, often over 200 feet in height and 10 to 12 feet in diameter. Foreign pines never reach one half these dimensions. Five of the pines bear longer, or heavier, cones, with larger seeds, than are found elsewhere. The sugar pine—our forest queen, located on the middle heights of the Sierras—often has cones pendent, heavily laden with seeds, fifteen inches to two feet long. The Coulter pine of San Bernardino and contiguous mountains bears cones weighing eight to ten pounds. The gray-leaf pine, bordering the Sierra foothill regions, bears cones three to four pounds in weight. The Torrey pine, limited to the high bluffs near Del Monte to twenty miles north of San Diego, yields cones two pounds and over in weight.

Two of our native spruces attain enormous height and dimensions. The graceful Douglas spruce of the Sierras and Northwest, and on near-by Mount Tamalpais, grows from 300 to 450 feet high, with a trunk often 8 to 12 feet in diameter. From this tree are made telegraph poles, fence boards, railroad ties, piles for wharves, and piles to be placed under the foundations of heavy buildings in partially made lands, masts for ships (foreign and domestic), and most of the flooring and studding for buildings. A spruce in the San Bernardino Mountains bears a cone five to seven inches long and three to four inches thick—the largest of its kind known.

Our two world-renowned redwoods often can be found 300 to 320 feet in height, with a diameter of from 20 to 35 feet, still growing and bearing aloft their noble crowns—not exactly hoary, even after having reached three to five thousand years. These two species of redwoods—commonly so called—the sequoias—are the only two survivors on the face of the globe, but the fossils of the coal deposits reveal about fifty extinct species. One of these surviving species, the interior redwood—the giant sequoia—that is now struggling to hold the ground against all its enemies except man (be it to his shame!), bears fruit, the largest of any yet discovered of its now extinct fossil family. Again and again the individuals of this forest giant have been measured and careful figures made as to its height and diameter. Poets and sentimentalists, and many practical business men, have been awed in the presence of these giants. But a few, comparatively, acting only on business instincts, greedy of gain in property for the present, with no thought or care for the future, walk boldly up before these majestic presences, size up their value as so many dollars, and, with murderous ax and saw—all unheeding their mute protests—cut them down, behead them, strip off the thick, protecting bark, and if they are not shattered by the terrible fall, one may behold in these forest slaughter-pens numbers of stark white trunks laid out like so many soldiers on a battlefield.

Should not all thoughtful men and women cry out in protest and demand their protection by our Government? It is being done, and will continue until all possible are saved of this historic, left-over branch of this grand, unique family of conifers, for there are other species of trees that will reproduce themselves in a shorter period of time, and will as well or better answer all the needs of man.

The coast redwood, the *Sequoia sempervirens*, has been more directly before the public eye than the interior one, the *Sequoia washingtoniana*. As you all know, our last State Legislature purchased a fairly good-sized tract of several hundred acres, known as the Redwood Basin. This is saved as a monumental credit to California.

By the way, practical forestry should be applied to all kinds of forests where lumber is demanded by civilized man. This demand is on the increase, and the forests are on the decrease at a rapidity almost beyond calculation or belief at the present time—so rapid, in fact, that however carefully husbanded from waste and destruction by fire, experienced men have predicted that our forests will have vanished within fifty years; hence the need of forestry associations and careful preservation by enactment of forestry laws. The demands of civilization may be summed up in two general classes:

1. A demand for the area on which the forest stands, as land highly suitable for cultivation; then the destruction is necessarily complete and in order. But, then, certain tracts remaining covered with trees would be a great gain to the farmer.

2. The encroachment on the forest solely for its products is enormous, such as fuel, charcoal, building purposes generally, including shipbuilding; fences, railroad ties, telegraph poles and electric poles, mining purposes, bark for tanneries, turpentine, rosin, manufacturing of numberless domestic and fancy articles and utensils; the manufacture of matches, paper pulp, etc. Each of these growing needs causes a tremendous use of lumber. Those alone of matchmaking and pulp for papermaking are enormous drains upon our forest products.

To protect and help nature maintain its forest domain, and at the same time minister to the needs of man, forestry attempts, in the study of the reasons for the growth of trees, how they grow, the conditions needful as regards heat, light, and moisture, the conditions and climate best suited for reforestation, trees adapted to the various localities, enemies of the forest and means to check them, etc.

Forestry is, in short, an exact but movable science, past the experimental stage, notably in Germany. We have no need of working in the dark—only to fall into line and walk in the light.

Many lumbermen, lumber merchants and those directly interested in our forests in a material way have a mistaken idea that forestry endeavors to save intact the virgin forests. Forest products form a most important part of our country's resources. During the past two years the yield in lumber has been much more than all our mining output. Man is as much entitled to the harvests of the forests as to the harvests of the fields—and that's not the rub—the harvest must come, but not as a detriment to future crops, near or distant. The lookout is that ultimate destruction shall not go on. It is impossible to preserve forests in all parts of the earth where they naturally grow, but it is a duty, and should be a care for every section of our land to set aside portions of our forests, where watercourses are imperiled, replant or reforest, where the mischief has already thoughtlessly or recklessly been done. Forests should be maintained in our republican land for the good of the many by the will of the people. Forestry will point out the best places for the maintenance of forests, as the different regions may vary in their needs.

Agricultural regions should have some forest trees on all farms, as almost all regions of the earth's crust, even where the soil is good for farming generally, will have some thin, poor soil where crops can not be raised profitably.

There will be some damp places where certain trees will grow and annual crops will not thrive to any profitable degree;

On borders of rivers and streams there would be immense help for prevention of evaporation and loss of water, by tree-growing;

On mountain slopes, summits, hilltops, etc.

As a rule, the areas for perpetual forests are naturally in mountainous districts, for good reasons.

The cold mountain slopes, chilling the air, cause a greater deposit of moisture and rain, no matter which way the wind blows.

The principal rivers of the earth have their sources high up in the mountains, and if the forests are removed the rain drains off so fast that the soil that took unknown time to form by the crumbling of the rocks to dust, and the slow formation of vegetable mold from the decay of millions of generations of plants, is washed down and off, and then there is no more chance to reforest. Then dangerous floods are sure to come, the springs overflow, and later dry up, the mountain slopes being too hot by day and too cold by night. Result: Early frosts come to the farmer in the low lands, the face of the whole country is changed and the fullness thereof, and the farmer, in wonder, puzzles over the situation, but the well-posted and avaricious lumberman does not. But the signs of the times point to a general awakening among women as well as men, of all classes. Many large lumber companies, with millions at stake, are asking for the best, economical plans from our foresters. Others have resolved from their own experience to save the small trees, notably the match manufacturers, who have recently purchased about fifty thousand acres in Northern California, determining to save the small trees.

Along another line, the Government has determined upon the restoration of the forests—that of reforestation. The first person to act along this line upon a large scale was the late Sterling Morton of Nebraska. He caused to be planted immense areas and waste places in Nebraska with success, for they are flourishing vigorously to-day and a stimulating example for others. To him, also let it be remembered, belongs the credit of suggesting the setting aside of a tree-planting or Arbor Day. Over forty different States of the Union now fittingly observe Arbor

Day. In our own State, a few years ago, there was an attempt made to observe this day, but from bad management it fell into disfavor, and only Goat Island bears weak testimony to the movement of tree-planting in the wrong season of the year. Recently, however, about three years ago, since forestry has been adopted as a leading topic by the State Federation of Women's Clubs, and now by the National Federation, all acting in harmony with our State Forest and Water Association, there is a general awakening in various lines of forest activity, such as planting trees upon city streets and public highways, where miles of trees are being set out and carefully tended and made to grow. Recommendations are being carried out in many localities to observe an Arbor Day, where the citizens, men and women, and the teachers and school children, unite in this work. Let us hope that, before long, all portions of this State will wheel into line and fix upon a day, suited to the various localities, when trees should be planted, and so practically celebrate their Arbor Day. In our own State, with joy let it be spoken, reforesting is going on under Government supervision and provision, by seed-planting, over entire slopes of the San Bernardino Mountains.

We may well take courage for the future welfare of our country, when President Roosevelt, in his first message to Congress, stated that, in his judgment, forestry and irrigation were the most vital internal questions of our country, and in his message to the present Congress he says: "Few subjects of more importance have been taken up by the Congress in recent years than the inauguration of the system of nationally aided irrigation for the arid regions of the far west. A good beginning therein has been made." He further says: "Now that this policy of irrigation has been adopted, the need of thorough and scientific forest protection will grow more rapidly than ever throughout the public-land States."

We women of California hopefully look forward to the purchase, by the Government, during the present Congress, of the noble Calaveras big tree grove, as this virgin forest of giants can not be duplicated in thousands of years, if ever, when once destroyed. Now they are the wonder of the world in their unsurpassed grandeur. Let us discuss for a brief time the present proposition of Government purchase of the Calaveras big trees: The proposition is now plain and has assumed an entirely business character. Not every millionaire or man of means is approachable with the thought ahead of increasing his wealth, and to that thought the added one of relinquishing the pet scheme. Happily for us, Mr. Robert Whiteside has great appreciation of the historic value of the groves.

Now, let us women dismiss as much as possible the side of sentiment for the nonce, and try to weigh the business side. Mr. Whiteside bought what is known as the Sperry tract of 2,300 acres, including all of North Grove and two thirds of South Grove, for $100,000. Later he added nearly two thousand more acres, and for two years employed three experts for the purpose of estimating the value of each tree. In the North Grove there are 101 trees named for distinguished persons or places, with marble tablets inserted in the trees. In the North and South Groves there are 1,500 sequoias, besides a heavier growth of valuable sugar pine, in commercial value far exceeding the sequoias, valuable as they are commercially. The purchase of this tract was more for the value contained in the sugar pine forest than for the intrinsic value of the sequoias. For the entire tract Mr. Whitesides asks the moderate sum of $500,000. In ten years the value of the increase will amount to more than $1,000,000.

An experienced lumberman from Maine made an exact estimate of the value of "The Mother of the Forest," in the North Grove, and reported that it contained 537,000 feet of one-inch lumber. Cutting down that estimate to reach a fair average for the 1,500 trees, making it 400,000 × 1,500, it would equal 600,000,000 square feet. It is worth on the stump surely $1 per thousand feet, for Michigan white pine lumber is worth $7 per thousand feet. So estimating the 600,000,000 square feet at $1 per thousand feet, it would be worth to the lumberman $600,000.

In this tract there are 45,000 pine and fir trees, the larger part being the valuable sugar pine, and one fine sugar pine will average, at a very moderate estimate, over 44,000 feet of one-inch lumber, 45,000 × 44,000 equals 1,980,000,000 square feet, estimated to be worth at least $1,980,000; this sum added to $600,000, equals $2,580,000, and this is a very low estimate.

These figures and data are drawn from observations made and facts gathered during a residence, at the groves, of two and one half years by Mr. and Mrs. J. M. Hutchings, and furnished me by the widow of the late J. M. Hutchings, who recently, as you know, met his death in a runaway accident, caused by their horses being frightened by a bear just as Mr. and Mrs. Hutchings were entering their beloved Yosemite Valley.

OUR FARMING FADS.

BY MRS. MINNA E. SHERMAN,

President of the Women's Agricultural and Horticultural Union of California.

We had lived in the city from birth, yet we did not deem it a hardship when, fifteen years ago, the failing health of the beloved father made necessary a residence in the dry climate of Fresno County. Therefore, with light hearts we left Oakland to make our home on the ranch. The first three months were full of the pleasant bustle of making city furniture fit a country house. We were unfortunate in having a house of so rambling a construction that the men handling the furniture frequently lost their way. I do not believe that any set of furniture was assembled until there were made, at least, six distinct efforts.

Then came the long and weary days, as we watched the waving lines of light that rose and simmered in the heat, as we wearily listened to the doves moaning and mourning—we were, indeed, lost on the plains. Sand, sand, everywhere under foot; dust, dust, everywhere else. Then realizing the depth of the depression closing down upon us, we resolutely sent for current literature to wake us up. All at once came the consciousness of catalogues of vividly-colored vegetable monstrosities, with a few flower seeds modestly described at the back.

Then gardening became our fad, for the ranch's only ornamental plant was one red oleander. The former utilitarian owner had planted rows of eucalypts for firewood, alternating with rows of staked grapevines for wine-making. These were all planted in straight lines, with driveways at right angles. Half the trees and all the vines disappeared at once, and palms were planted to follow the curving lines of the new roadways. From a monotonously planted sand bank, in a little while sprang a smiling garden, bright with color, restful with green, and full of the sound of happy bird life.

In Central California the rose gives the home gardener great satisfaction, for nowhere in the State do roses grow to greater size or are they more perfect. When well established they resist heat as well as an orange tree. Geraniums, heliotropes, fuchsias, and many others of the soft-wooded plants require protection from the hot winds of summer. All the rose family except the Maréchal Neil and Niphetos do well under the cultivation of the plow and harrow, and if planted in long, curving rows the horse can walk down the rows to the end, turning on the roadways, ditch banks, or paths. Plowing greatly decreases the care and gives the good result of deep cultivation. The curves should be short, and often the Hogarthian line of beauty can be used with good effect. We have had in the rose garden as many as two hundred and fifty-eight named roses; many of these were too nearly alike, others not pleasing in color, others had faults in flowering, and more had undesirable habits of growth, but these faulty ones soon found a place along the screen borders of the chicken yards. We have now, in the prominent parts of the garden, eighteen hundred and fifty bushes of forty-two varieties that are all that could be desired. Each year we buy a few of the highly recommended new roses; those that prove desirable remain in the beds, and from them cuttings are made for new beds.

A rose cutting twelve inches long is planted ten inches deep, just where the bush is desired to grow. If put in after the first rain and before New Year's they will rarely fail to grow and produce numerous roses the next summer. It seems to be the nature of roses to renew their strength by sending up new shoots from the roots. When on their own root those producing fine roses are usually left alone. Budded roses are apt to send up these suckers in August, when it cripples the strength of the plant to remove them. When we purchase budded roses—it is difficult to procure the new ones on their own roots—we are obliged to shelter them during the first season with palm leaves and remove all suckers at once. If the rose survives the hot weather at all, it rarely fails to make some growth in the fall. We make cuttings of this, and so sure are we of their growth that we pay no further attention to coddling the original bush.

The oleander is valuable for windbreaks behind the roses. Many of the new single varieties are very beautiful. Even the little seedlings that spring up are worth caring for, as they rarely fail to produce a pleasing flower. Again, the oleander is valuable for planting on driveways, as its leaves shed the dust and the color and form of their foliage contrast well when alternated with either the elm or the palm. It is a mistake to plant oleanders with the umbrella, eucalyptus, or olive tree; with these trees, pampas grass or palms should be used.

Chrysanthemums grow magnificently, but, oh! the care and aching back to produce a scentless Oriental-looking flower—larger than those grown by the neighbors—flowers one never learns to love for their sweetness, but only to marvel at their unkempt appearance. So we huddle them into the jardiniere, and in the artificial surroundings of the house they look better and more at home than in a garden full of Nature's sweet simplicity. It seems strange that so poetical a people as the Japanese should have perfected this flower. Can you imagine a poet singing:

> "Go, lovely 'mum!
> Tell her, that wastes her time and me,
> That now she knows,
> When I resemble her to thee,
> How sweet and fair she seems to be."

Or can you imagine a girl being flattered by the song:

> "My love is like a yellow, yellow chrysanthemum,
> So sweet and fair is she."

Rhododendrons, azaleas, camellias, and even the lilac, require shelter from the midday sun of August. Clumps of native shrubs, with crepe myrtles and syringas should be in every garden; they vary the background and mingle kindly with cannas, bamboos, yuccas, and the smaller palms. These afford a wide field for decorative gardening.

Many of the best effects we see are accidental combinations. By watching for these and by patiently reproducing them will we learn the possibilities of the plants that can be grown thriftily in our gardens. A sickly plant—no matter how rare—has no place in the ground, for it can have no beauty to commend it.

In the gardening of the city parks it is often apparent that either Eastern or foreign men laid them out and were blind to the opportunities afforded for picture-making by the mingling of forms and colors of the wide range of plants that grow in perfect harmony in California soils.

There are many who call all our everyday plants common, as the marguerite, nasturtium, and geranium. Even the eucalyptus tree has been deprecated by calling it a shoemaker's fantasy, made of linen strings and scraps of leather. It is a tree that lends beauty and dignity to the California landscape. In form, it varies from the stiff martinet of the globulus, to the willowy grace of the viminalis, while the rudis gives a maple-like character to the surroundings. The color of the foliage runs from the soft silver gray to the tints of blue and all the shades of green. If you do not appreciate these trees, perhaps you could see their beauty and poetic mystery as seen by the artist by visiting the studio of Mr. Cadenasso.

Ornamental vines are useful in covering up the deformities of style and the cheap wood-work of a house, and if trained to climb on three-foot wire netting nailed to wooden brackets, they are easy to handle without greatly damaging their beauty when repairs are required to buildings. So gardening was our first fad and has proved to be a lasting consolation.

Our second fad was fancy stock raising, and grew out of the developing of two registered Holstein heifers. Then came the desire for more fine cows, so we purchased a bunch of heifers of the strain of the animal we liked best, from a man of repute, who had never forced his cattle in prize contests. These forty-two heifers, brought from Montana, were of quite a different type from the black-and-whites commonly seen on this Coast, so that many dairymen looked askance at them, yet they were of high dairy type and differed from the thin-milk Holstein that so often represents the breed. When these cows reached maturity twenty-one were producing over five hundred pounds of butter per cow per year. The second generation gave us many heifers that made over two pounds of butter a day, with first calf. Alfalfa, the greatest of feeds, is at its best when fed to cows with an inherited capacity to produce heavily without constant nursing. A paying creamery business was built up under personal supervision. However, when it became necessary to employ a manager it was not possible to find one to carry on the business in the sanitary manner we had maintained. When an appreciative purchaser came who wanted the best of cows, and intended to give the best of care to them, we sold a hundred head of the registered herd. How good they were you can see by the fact that eighteen are now advance registry cows. One, Fiddesa, now holds the four-year-old H. F. record for butter. Another, Romeo Aaggie Acme, has surpassed the record of De Kol 2d, the head of one of the most fashionable families of Holsteins. Acme's son heads our present herd, and we hope by him to increase the butter production to yet a higher point. It is a constant source of pleasure to raise fine animals, watching for weaknesses and trying to breed away from them, trying to increase production and keeping the animals strong and vigorous under the strain. The making of fine butter led us to the making of cultures and to the fascinating study of bacteriology. Yet when skill was acquired, the work palled, and the collecting of small bills became a nuisance, for we did not have enough of the commercial type in us to care for the money except as a measure of success, never as the worth of the personal equation that inspired the effort. Yet financial results are often interesting. In this fad was invested $2,675 for the cattle purchased. We sold $18,600 worth of cattle and have now on hand $2,500 worth of young stock.

Our third fad was the making of a fancy pack of Emperor table grapes. We tried to pack these as we thought we would like to receive fruit packed if we were buying it at a fancy price in the East. The packing was a success—so were the prices received—yet we had not really learned how to produce a crop, for we were merely selling all we happened to grow that was fit for shipping, for cull we would if it took all the crop. Well, shameful to relate, five years ago our crop used to be forty-five to fifty per cent culls, but we studied grape culture hard and watched the vineyard carefully, until the culls have been reduced to less than ten per cent. As the pickers take all the fruit on the vine, and the packers cull as they pack, some fruit is thrown out that is green and not otherwise defective. We used to think that if one of our cars sold for over $1,000 we did well. Two years ago we passed the $2,000 mark, setting the record at $2,604. This year we have sold six cars for over $2,000; one car sold for $2,668, the next for $2,688, and the highest for $2,775. So the returns from thirty acres planted to Emperors will be over $13,000, after freight, refrigeration, commissions, and packing materials are paid for.

The happiness of these fads is in the doing; the success, after all, counts for little, except to show that the work was perfectly completed. Then it may help others—many to be more malicious and envious, a few to follow to a like success.

VILLAGE IMPROVEMENT.

By MRS. E. P. McCALLUM, of Oroville.

Only by request, tendered as late as yesterday afternoon, was I aware that I should have a place upon this program, and necessarily, on this account, and from the fact that I have been kept extremely busy in connection with the convention, my remarks will be brief and somewhat crude, based almost entirely upon actual contact with the work in the immediate vicinity of my home—Oroville.

The women of Northern California have organized improvement clubs, for the purpose of working in connection with the Sacramento Valley Development Association, our object being to so improve our home surroundings, by pointing out, and executing if possible, such sidewalk, street, alley, and suburban improvements as may be found necessary, and as far as possible making our homes and surroundings delightful for our own habitation, and attractive to the visiting homeseeker.

It is very gratifying to notice the notable improvement which has been made during the short period since our organization.

As we progress, we receive encouragement all along the line, both from the recognition received from the male inhabitants of our little city, and from the constant development of work which needs our attention, unthought of at the time of our beginning, and the further unthought of possibility—the presence of our husbands at our meetings.

We have attempted the establishment of drinking fountains on our prominent street corners, with much hope of success.

The sidewalk trees are trimmed to a uniform height for pedestrians.

The Oroville club is advocating the improvement of the surroundings of our railroad depot, and the opening of two new streets, in order that the school children from one portion of the city may reach a school without passing through the business portion of town.

Among other works, we are looking after and beautifying our cemeteries; caring for the lots of non-residents, which are generally left uncared for; beautifying and tree-planting in our school yards; tree-planting on sidewalks and public drives, and many other improvements, thought of and made possible only by the intervention of ladies.

Probably the most important work undertaken by the Butte County ladies during the past year was the attempt to prohibit the sale of liquor in Butte County. An earnest fight was made, and against great odds we lost an election held to decide the question by only about four hundred votes.

There has been, until recently, present at our meetings a noticeable timidity and inability to "crowd through" measures as successfully as our brothers do. In many of our clubs, however, these difficulties are being rapidly overcome, and at a district federation of clubs which I attended in Woodland there was an unmistakable advance and deep-seated determination among the members to keep on with the work, and in many instances the local clubs have been encouraged by the co-operation of City Trustees and County Supervisors to such an extent that in some instances they are given from $50 to $75 per month with which to meet necessary expenses.

As a result of my attendance at our various clubs, I find it very laborious work for the ladies to carry out their work in a business-like and diplomatic manner—mainly due to an almost total lack of parliamentary rules; and in contemplating this condition of things I am very much of the opinion that if a little time were given to this study in our public schools it would be much better spent than when taken up by the study of ancient history.

The woman whose education must be confined to the public school, wants a practical education which will enable her to combat and overcome the problems with which she is confronted in the business world.

An essay on "The Labor Question in the Vineyards and Orchards," by Mrs. G. W. Aiken, of Oleander, was read by Mrs. A. R. Galloway, of Healdsburg, as follows:

THE LABOR QUESTION IN VINEYARDS AND ORCHARDS.

By MRS. G. W. AIKEN, of Oleander.

Fresno, Tulare, and Kings counties, California, are, indeed, veritable gold mines to the laboring classes during the fruit season. I doubt if anywhere in America, men, women, and children can earn as much in so short a time. They come from the hills, valleys, and plains, Fresno being the Mecca.

First comes the cutting of the apricots, to be followed, a few weeks later, by peaches, nectarines, pears, and plums.

When the cutting is over in the orchards, most of the people find work in the packing-houses until nearly Christmas. Men and women make, on an average, $2.50 per day, while children from ten to twelve years old readily make $1.50 per day. Every age and size is pressed into the service. I have seen little children, six years old, cutting apricots, and doing it well. The rule seems to be, that when they can handle a knife they are fit for work. Cutting fruit is hard work, and the cutters justly earn what they make under existing conditions—heat, flies, snatch a bite when you can, etc., as there is little time for cooking.

Fruit harvest is a harassing time to the housekeepers, hotels, restaurants, telephone offices; in fact, every place where help is kept. The power of resistance is great in some natures, but as a whole human nature is weak on one point, and that point is money, consequently household help is at a premium. Families who can not do without it are obliged to close their homes, and go away, the seaside resorts reaping the benefit of insufficient household help in the fruit counties.

Speaking of seaside resorts, reminds me of a good story I can not resist telling. A Fresno County lady rented a house for the summer at Santa Cruz. The landlord wanted to sell her the property, and set forth, in glowing terms, the many advantages of living in such a desirable climate, etc.

"No," said the lady. "I do not want to buy a home. I have a good one in Fresno County."

"Fresno County!" he exclaimed, perfectly horrified. "In that roasting place! Why, I'd sooner live here in a 'shack.'"

"Allow me to tell you, sir," she said, as she looked him in the eye, "If it was not for Fresno County you would be living in a 'shack.'"

In the orchards and vineyards the labor is decidedly cosmopolitan—Americans, Chinese, Japanese, Russians, Mexicans, Italians, Germans, Indians—*any one*. Necessity knows no choice. It is take or leave, and often you are left with the grapes on the trays when the rain comes.

Ten years ago the growers depended almost solely upon Chinese labor. "Bosses" regulated the prices and the men. The number of pickers wanted were brought to you, and when they had finished your work you took them to their next. No fuss, no trouble. They worked for $1.50 per day; were slow, but did good work.

With the advent of the Japanese came a change. They started in to work for 80 cents per day and were readily hired.

In a few seasons it became apparent that the Chinese were getting scarce. Where had they gone? Some thought that the Chinese-Japanese war, which took place in 1894, called a great many home; and probably the late uprising in China took many more; and, since the Chinese Exclusion Act has passed, they will have to remain there. Just how the Exclusion Act will affect our interests remains to be seen.

An "outsider" would naturally say: "You have the Japs. Do they not give satisfaction?" Yes, and no. The little men are the most erratic creatures one ever had to do business with, at certain times. I liken them to the Irishman's flea. "You think you have them, but you haven't." They are bright, quick, agreeable, and polite, but there seems to be a deficiency in their mental make-up, for they can not, or do not, understand that honor should obligate them to stay with their employer when he needs them most. You can watch over them as tenderly as a hothouse plant, but when grape-picking time comes, no matter how busy you are in the fruit, they will politely say: "I go now, bossy-man. I come by-and-by." And they are gone, leaving you to mourn their help, and call all the members of your family in to the finish.

There was a time when the fruit was out of the way before grape-picking commenced, but during the last few years the seasons have been somewhat like the Japs, uncertain; and this year grape-picking caught us with fruit in the orchards and on the trays.

Like the Chinese, the Japanese work under "bosses," who make all contracts for them. For example: Your contract calls for twenty men to pick sixty acres of raisin grapes. Well, the twenty will come bright and early, and work like Trojans, running from vine to vine, scarcely taking time to breathe. Why such haste? Two and a half cents per tray, and time counts. They work so fast that a great many make as high as $5.00 per day.

At the rate they start in, you feel happy, and your face wears a benign expression, as you think how soon the crop will be picked. But, alas! your exultation has been premature. You will think so, when about the third day you see a falling off of pickers; the fourth day another falling off, and they keep falling off until there are only two or three left. Where have they gone? To hold down other "jobs." You can expostulate, and implore, but the "little gentlemen" are passive, and polite, and it ends by you having to submit to their way of doing business. And why? Because you can not help yourself. The fact of the matter is, they take more work than they can satisfactorily do, and in order to hold the contracts the bosses string out the men.

Only those who understand the situation can fully sympathize with the vineyardist in his anxiety to get his grapes dried. Why, even a day counts at such a time, and the least delay brings broad visions of stacking and unstacking, at a cost of from 50 to 75 cents per hour for each little man.

Now, no reasonable person will advocate the importation of Mongolian labor if our own people could do the work, but it has been proven conclusively that the majority of white men are not physically constituted to stand the extreme heat of our climate. Some of our men and boys pick grapes in a case of necessity, but not as a rule.

The estimate of the raisin crop for the last three years is as follows: In 1900, 45,000 tons; 1901, 35,000 tons; 1902, 50,000 tons. Value, $3,000,000 annually. There are about 500,000 deciduous fruit trees in this county alone, and the value of the crop is estimated at about $1,500,000. The above figures will give some idea of the immensity of our fruit interests.

In reviewing the situation it stands thus: The help we depend upon mainly commenced to work in the vineyards for 80 cents per day. They have been gradually raising the wages until at the present time they average from $3.50 to $4.00 per day. As the first was too little, the last is too much.

Our growers are perfectly willing to concede that the work demands more than ordinary wages, and are willing to give just compensation for services rendered, but not exorbitant.

Each year the vineyard and orchard acreage increases, which will necessarily demand more outside labor, and if the past few years, and present, are indications of the future, it behooves the grower to study the "Help" problem and try to find a remedy.

DISCUSSION ON THE LABOR QUESTION.

MR. GORDON. I wish to say a word on the labor question. In these conventions we meet and discuss tree-planting and the getting of more people here to go into the tree-planting business, and we discuss very little about the labor question and the getting of labor to handle the fruit we raise.

In the fruit business the most alarming thing to me is the labor question. In the county of Fresno there are probably 65,000 acres in bearing vines. In raisins they figure about one man to three acres, and I have even more than that. The picking has all got to be done in about thirty days, and if the crop is not picked within this time we will lose. In the 65,000 acres in Fresno County we need ten thousand people to handle the crop. If we keep on increasing as we have been increasing, what are we going to do for labor? If the importation of the Chinese is advocated, we are condemned. We are advertising in every possible way to bring people here to plant out more fruits of all kind, and what in the world are we going to do in the next few years to handle that fruit? In Fresno, as I say, we have 65,000 acres and we have not got the help to save our crops. We have got to begin harvesting about the first of September and quit about the 25th of September, otherwise we shall probably lose our crops on account of the rains. We can not get white help in California to do our work. We have got to have labor that we can ship around from one place to the other, and we can not possibly get along unless we have Chinese or Japanese labor, that we can haul around from one section to the other to perform the labor on the different fruit crops—so that when we get through with the raisins in Fresno we can ship them to some other section to handle other fruits. If I had one million dollars I would not plant another vine unless I knew some solution for the labor question. Americans can not go out in the hot sun and stoop over the vines all day long when the thermometer is probably 115° in the shade. Our American sons won't do that, and if they ever have I have never seen it. I can not see how we are justified in advertising this State and its fruit industry so as to bring more people here to plant orchards and vineyards, thereby making labor for ten thousand more people, and yet vote against any more Chinese coming in here. I don't like the Chinese, and I like the Japanese less, but we have got to have them to perform our labor. When I first started this year with Japs, the first day or so I had sixty of them, in three or four days I had only forty, in a few more days I had only twenty, and in a short time afterward I had none at all, and my raisins had not all been picked, either. They take too much work and are able to complete none of it. We have not got one half the help we need in Fresno County to handle our crops. The only reason now that we succeed in saving our crops is the system the Japs have of contracting labor. They do two times the work under contract that they will do when you pay them wages. In that way we can get our fruit picked. The contract system does not give satisfaction, and if we have to hire for wages we will only have half the labor we require. I love California and expect to remain here while I live. I appreciate that it is a great fruit country, and recognize her possibilities, and yet I recognize that we can not go along prospering without help to handle our crops. The Chinese seem to offer the only assistance, and if a man gets out in public and talks in favor of the Chinese, he is blackmailed and run out of the country almost. If there is any committee of fruit-growers who can come to me and explain how I can continue in the vineyard business in Fresno County under the present conditions, I will give them an oyster supper, or, better still, I will keep them for a week, and feed them on oysters during all that time.

A MEMBER. Well, when you have the Chinese and Japanese and employ them in your vineyards for, say, thirty days, what is to become of them after that?

MR. GORDON. They can then be sent to the hop fields, to the strawberry fields, to the peach orchards, and can be kept moving to handle all the various fruits in the different sections. They can be kept moving about the State in this way, getting twenty to thirty and forty days in a place, which will keep them employed all the season.

MR. SPRAGUE. Now, it seems to me that this question is reducible to very simple terms. It seems that our Oriental labor is the only labor to be had in the raisin business, or that can be used there. It seems that Chinese labor is utterly cut off; there is no hope, for years at least, of getting any repeal of the Chinese law now in force. It is clearly evident that we are reduced to Japanese labor as the last resort. It seems to me that the Japanese are a good deal better organized than the owners of the vineyards. Consequently, the Japs have the growers at their mercy, because they are not organized. The only thing to do is to secure such organization among the employers of Japanese labor as will secure a uniform plan. It seems to me that a vigorous effort at organization might bring something out of this almost hopeless situation—organization seems to be the only hope.

MR. RODGERS. Why is there no chance for the repeal of the exclusion law two years from now?

MR. SPRAGUE. Because the people in favor of that exclusion law are in the majority. I may be mistaken, but that is my opinion. I think the sentiment is rapidly changing among the orchardists of our State. It is a very unpopular subject, and it has been made so by all parties. Every man who has studied the conditions knows that within the last two years, in nearly every section of our State, thousands of tons of fruit and vegetables have gone to waste through lack of labor, and now thousands of young trees are coming into bearing each year, and I can see no other way than to have these laborers.

MR. RODGERS. The labor unions and skilled labor would complain against the importation of Chinese, but since the exclusion law went into effect we have been admitting thousands of other foreigners who do not take the place of the Chinese, but who are taking their places among the skilled labor of the country. Our valleys are filling up with Slavonians and people from southwestern Russia.

MR. DORE. For several years I did the work in my vineyard with the best white help I could secure, and it cost me a great deal more than I could have had it done for by other labor, and while I needed only about fifty men I had over two hundred names of laborers on my roll during the grape-picking season. I had to keep my team continually on the road between the ranch and Fresno taking them to town, or getting new men, bringing home the drunks, straightening out the fights, the arrests by the officers, or going to town to get my team which had been left standing there by some drunken loafer. It was an impossibility for me or any of my family to get away from the ranch for any length of time, nor could I feel safe in leaving my family there alone. These are God's truths. I continued in that way for about six years, and during that time, by an unfortunate condition in marketing our raisins, bad conditions with my soil and poor irrigation, I was continually running behind. I was never in all my life forced to work so hard, and I have been an employer to quite a large extent for about thirty years. The class of labor in California to do the kind of work that is required in those vineyards is a failure. The Japs fall very far short of giving satisfaction. Aside from being very unsatisfactory laborers, my experience has been that they break up my trees, steal my chickens, and eat them down by the side of the creek in the night time. They seem to do everything they ought not to do, and nothing that they should do. I can not control the people at all, so I bade good-by to the Japs. Now I am using white men entirely, and some Chinamen when I can get them. If the time comes that the labor problem is worse than it is now, my vineyard will be for sale, as many of the larger vineyards are at this time, and it is all on account of the scarcity of labor.

MR. JUDD. When this question of admitting the Chinese to do our labor came up here the other day, I was the only man who had the hardihood to get up on the floor and talk sense. All seemed to be timid about expressing themselves in favor of Chinese labor. Some of you say that this Exclusion Act can not be amended, but it is a fact that it has been amended to the extent that the sugar men in Hawaii are permitted to land a sufficient number of Chinese there to perform their labor. Why can't the same privileges be extended to the fruit-growing sections of California? You will note that when we had the Chinese to perform our rough labor they stuck right to it and did not enter the field with the skilled labor of our country, as do the Japs and other foreigners we are admitting to-day.

MR. RODGERS. I wish to offer the following resolution, and move its adoption:

Resolved, That it is the sentiment of the fruit-growers of California that the Chinese Exclusion Act should be so amended as to admit farm laborers in restricted numbers.

MR. GORDON. I second the motion.

On account of the lateness of the hour the resolution was not discussed, but was laid on the table for further consideration.

At this time the convention took a recess until 8 o'clock P. M.

EVENING SESSION—THIRD DAY.

THURSDAY, December 4, 1902.

Convention met at 8 o'clock P. M. Vice-President Wickson in the chair.

MR. SPRAGUE. I wish to offer the following resolution recommending the organization of local associations:

Resolved, That this State Convention of Fruit-Growers heartily approves of the organization of local associations, to be centralized for the management of a growers' sales agency in the city of San Francisco, and to this end it orders the appointment of a committee of seven to promote it, and invites volunteer aids for such organization work, and urges that every one willing to assist in this work in his own locality should correspond with the chairman of the committee to arrange for such organization work in his section.

On motion, the rules were suspended and the resolution adopted.

WET AND DRY SEASONS IN CALIFORNIA.

By PROF. ALEXANDER McADIE, of San Francisco.

If one could only forecast the seasons in California, that is, if one could state with some authority that an approaching season would show a rainfall in excess or below the normal, the agriculturist would be decidedly benefited. And not alone the farmer, but the stockman, the engineer, and the business man would find it to their advantage to be possessed of such information. In California a dry season means more or less hardship; and, on the other hand, a season in which the rainfall is generous and well distributed is, other things being equal, a year of great prosperity.

Our records in California cover a period of fifty-three years at at least three points, San Francisco, Sacramento, and San Diego. These have been charted from 1849 to date, showing the amounts for each season, each month, and also frequency and intensity curves for the whole period.

For a study of wet and dry seasons this is not a very long period, and yet it will enable us to determine several matters of moment. If the *Sequoia gigantea* could only be made to unfold the story of the three or four thousand seasons of their growth as indicated, say, in the rings of annual growth, we should then have a record from which we could determine the true periodicity of abnormally wet and abnormally dry years, if indeed such a periodicity exists.

Francis Drake struck our coast in 1579 and complained bitterly of our northwest wind and fog for the short period (practically the two months of June and July) he remained; but left no rainfall records behind him. There is said to be an old Russian record for Unalaska from 1828 to 1834, which shows that the year 1828 was warm; but there are no records for California that I know of until 1849. There is a statement in Bancroft's History of California that the crops failed at all the missions in 1829, and the inference is that the season of 1828–9 was one of drought. It is an interesting coincidence that, applying the Brückner thirty-five-year period in this case, we should find the season 1863–4 also a drought season, and again, after nearly the same interval, another drought period, 1897–8. The first marked droughts of which we have reliable records as shown by the chart is the season of 1850–1; the second, 1863–4; the third, 1876–7; and the fourth, 1897–8; or in all four abnormally dry seasons in the fifty-three years. Comparing the wet seasons, we have: 1852–3, then 1861–2, 1867–8, 1877–8, and 1889–90, or, practically, one abnormally wet season every eleven years. The thirty-five-year period is not apparent. It is of course not an easy matter to obtain a rainfall record that shall give a true measure of the character of the season; for both the frequency and intensity of the rainfall must be considered; and it can easily happen that a single marked storm, causing a phenomenally heavy precipitation, distorts the record in the matter of intensity without disturbing the time distribution. Indeed, every farmer knows that in considering the effect of rainfall upon crops it is not so much the total amount of rain in a given season as the way in which the rain is distributed throughout the season, which counts. Such a season as that of 1854–5 ought to be a good season, because the rainfall, although late in coming, was well distributed throughout the winter and spring months. The seasons of 1866–7 and 1868–9, although quite unlike in general character, seem like good seasons for the farmer, because of the distribution of the rain throughout the year.

Let us turn now for a moment and consider the topography of California and a few of the general relations of air movement, pressure distribution, and rainfall. The relief map of California speaks for itself; and we shall try to show farther on in this paper that with certain types of pressure distribution and consequent air movement the three great factors favoring rain, are present, viz.: the supply of water vapor, the air movement best suited to convey the same to California, and the necessary cooling agencies to facilitate condensation.

We can, perhaps, best study these general questions by selecting a number of months of similar name, but differing widely in the character of the rainfall. We are fortunate in being able to compare two winter months; one, February, 1899, which was of a very dry type; and the other, February, 1902, which was of the very wet type. The average precipitation, as determined by the records of two hundred and ninety-nine stations, the records covering for the most part a period of twenty-five years, for the month of February for the entire State of California, is 2.97 inches. The amount varies of course from 8 inches in the northern part of the State to less than 2 inches in the south, and from 4 inches at sea-level on the middle west coast to over 7 inches at Summit on the east at an elevation of over 7,000 feet.

During the dry month the average rainfall for the State was 0.45 of an inch, or an average deficiency of 2.52 inches, equivalent to a deficiency of 28,400 million tons of water. During the wet month there was an excess of 6.17 inches, or about 69,700 million tons of water over and above the amount which would fall in a normal February, approximately 33,600 million tons of water. Between the two extremes of very dry and very wet Februarys there is a difference of approximately 100,000 million tons of water.

A comparison of the amounts of water at individual localities during these months is of even more significance, for it must be remembered that while the spring rains are of great importance in the maturing of the crop, the bulk of the water-supply must fall before the end of February to insure proper germination and early growth. These figures are also of interest to engineers engaged in the construction of reservoirs, as indicating the amount of water in very wet and very dry winter months.

Stations.	Elevation, in Feet.	1899—Dry.		1902—Wet.	
		Tons Per Acre.	No. of Rainy Days.	Tons Per Acre.	No. of Rainy Days.
Auburn	1,360	19	2	1,437	16
Bakersfield	404	17	1	146	6
Boca	5,531	209	6	283	6
Bodie	8,248	15	2	254	6
Boulder Creek	470	70	4	2,877	17
Eureka	64	568	16	2,202	24
Fresno	293	2	1	275	14
Independence	3,907	....	0	191	3
La Porte	5,000	304	5	3,785	23
Lick Observatory	4,209	85	8	1,064	23
Los Angeles	293	5	3	378	7
Mount Tamalpais	2,375	31	4	1,438	23
Red Bluff	307	1	1	1,374	23
Sacramento	71	5	1	736	19
San Diego	93	34	3	178	8
San Francisco	155	11	2	821	19
San Luis Obispo	201	31	2	993	11

When, however, we study the rainfall through a number of years it becomes evident that there is a well-marked relation between pressure, wind direction, and rainfall. Grouping the Januarys into abnormally wet, wet, average, dry, and abnormally dry, we have the following:

Abnormally Wet—1850, 1856, 1862, 1866, 1868, 1875, 1876, 1878, 1881, 1886, 1890, 1895, and 1896.

Wet—1865, 1867, 1869, 1874, 1888, 1894, and 1901.

Average—1853, 1854, 1855, 1858, 1863, 1870, 1871, 1872, 1877, 1879, 1884, 1893, 1899, and 1900.

Dry—1857, 1859, 1860, 1861, 1880, 1885, 1892, and 1897.

Abnormally Dry—1851, 1852, 1864, 1873, 1882, 1883, 1887, 1889, 1891, 1898, and 1902.

Weather Bureau records began at San Francisco in March, 1871, and we are therefore able to compare the pressure charts of sixteen abnormally wet and abnormally dry Januarys. During wet years the continental "high" is considerably weakened and lies rather to the east of the Rocky Mountains, while the North Pacific "low" extends well in on the coast overlying western Washington, western Oregon, and northern California. An excellent illustration is that of January, 1896, and a similar distribution is found in all wet Januarys. During dry years the continental "high" is well over the northwest, and the North Pacific "low" does not appear within the United States. An excellent illustration of this is January, 1891.

Grouping the Februarys in a similar way, we have:

Abnormally Wet—1854, 1857, 1862, 1867, 1878, 1887, 1891, and 1902.

Wet—1855, 1859, 1868, 1872, 1884, 1890, and 1901.

Average—1861, 1863, 1869, 1871, 1873, 1876, 1879, 1881, and 1897.

Dry—1850, 1853, 1858, 1860, 1865, 1866, 1874, 1877, 1880, 1882, 1883, 1888, 1892, 1893, 1894, 1895, and 1898.

Abnormally Dry—1851, 1852, 1856, 1864, 1875, 1885, 1886, 1889, 1896, 1899, and 1900.

The relation of pressure to rainfall is like that of January. The conditions during a wet month are shown on the chart for February, 1902, and for a dry February on the chart for 1899. It is evident that when the continental "high" lies well to the northwest the month is a dry one, and conversely, when the North Pacific "low" overlies the northwestern portion of the country, the month is a wet one. If there were any way, then, by which we could forecast the permanent pressure areas we could forecast the air circulation, whether northerly, accompanied with dry weather, or southerly and wet. Southerly winds of great frequency, high velocity, and extended cross-section mean large quantities of moisture carried over the State. The exact factors determining condensation and precipitation are not definitely known; but the angles of inclination of the mountain systems in California to the rain-bearing winds are such that a general up-lifting of the air strata must occur; and this would favor precipitation. Conversely, winds from the north can bring but little moisture, and even this is not likely to reach very far west of the crest of the Sierra.

This relationship of pressure distribution and rainfall was first touched upon, so far as I know, by Professor A. J. Henry, in his "Rainfall of the United States." This volume was written in 1897, the data used being compiled to the end of 1896. It so happened that December, 1889, was a month of abnormally heavy precipitation on the Pacific Coast, while, strangely enough, January of that same year was an abnormally dry period. Regarding the chart for December, 1889, a very wet winter month, Professor Henry states:

> The pressure distribution is abnormal, as, also, the rainfall; indeed, a similar configuration of the isobars could not be found in a brief search through the records of the last twenty years. The chart represents an extreme condition, viz., a transfer of the usual track of low-pressure areas of the northern boundary southward to central California and the plateau regions of Nevada and Arizona, thus giving copious rains to a region the greater portion of which is ordinarily destitute of rain. Such a condition may not happen again in the next twenty years; but, having once occurred, it must henceforth be included among the possibilities of Pacific Coast weather.

The chart of dry weather for January, 1889, shows the winter "high" of the Great Basin extending well to the northwest, with winds naturally from the north or northeast, a distribution characteristic of dry winter months and similar in many ways to the usual summer month distribution.

And now a word or two in explanation of these "highs" and "lows," concerning which the forecaster always has so much to say. On a base map we assemble and plot the data gathered by many trained observers all working at the same moment. Contour lines representing the pressure and temperature are then drawn, giving us a relief map, as it were, of the bottom layer of the atmosphere. The clouds, wind directions and velocities, temperature extremes, and rainfalls are also entered.

On such a map the great eddies or disturbances in the atmosphere are quickly noted. An ideal storm is a vast whirl or eddy in the atmosphere, and the winds are simply the air currents initiated by the storm. Thus, on the front side of the storm the winds are blowing spirally inward, and as the disturbance approaches the coast the winds are from the east. When the storm passes, the air still moving in toward the center of the disturbance is felt as a west wind. The entire disturbance or eddy has a motion of translation as well as its own proper motion of rotation. The larger number of our storms pass eastward through British Columbia. In the winter months many have a southerly component of motion, which results in what we call the "southeaster." Storms may move in any direction—eastward, southeastward, northeastward, and occasionally being retarded in their progress, will seem to move westward or backward.

Under just such conditions the north wind blows over the mountains for perhaps forty-eight hours, then dying away, the cold dry air settles in the valleys, and during the night and morning hours, owing to the rapid loss of heat by radiation, the temperature falls quickly and great injury to oranges results. Even here the water vapor in the air is the important factor. As we shall see farther on, the vapor of water is a good friend in warding off frost.

As you will readily understand, the forecaster is handicapped on this coast by the lack of reports from the ocean. Small wonder if a mistake is sometimes made in locating the center of one of these vast storms.

And this brings us naturally to a study of the storms of the Pacific, and especially of the typhoons of the China sea. These storms resemble the dreaded West Indian hurricane. From July to November on the Asiatic side of the Pacific and on our own South Atlantic seaboard these brother storms, separated by nearly ten thousand miles, sweep along, moving from the tropical regions eastward slowly and recurving or "doubling on their track" over the West Indies and the Philippines. A few years ago these storms and storm tracks were of interest only to the student of meteorology and the few who traveled in these unbeaten paths. But now, they have an importance to the people of this country little dreamed of before the battle of Manila Bay. Not only are our battleships and transports at the mercy of the tempest, but also that great fleet of transpacific liners hurrying to and fro across the broad stretch of waters, seven thousand or more miles, and freighted with life and property. What the fury of the tempest may accomplish, let the story of the Samoan hurricane tell. On those eventful days, March 15–16, 1889, representatives of three navies, the United States, Great Britain, and Germany, were exposed to the full fury of the storm. The "Calliope" inch by inch fought her way out of the harbor; but what befell the others is known to all.

Surely, then, it is well worth our while to study the paths and structure of these great eddies, against whose power we must pit our knowledge.

Forewarned is to be forearmed, and much could we say about the warnings issued by our meteorological observatories and the good accomplished. Along our own Atlantic seaboard during the hurricane season, from Barbadoes to Martinique, Dominico, Guadaloupe, St. Kitts, St. Thomas, Porto Rico, Cuba, Nassau, and even south to Dutch Guiana, the United States Weather Bureau has its trained observers on watch, and for the past three years very exact and thorough warnings of the approach of the storms have been given. In the East Indies, the observatory at Manila has attempted some typhoon or baguios warnings, and quite an elaborate study of the storm tracks has been made by Padre José Algué.

Thus far we have considered storm structure as noted and viewed from the ground. Could we chart the conditions existing at an elevation of 5,000 feet, possibly the contours would not resemble those made at the earth's surface. Even to the eye what a difference there is between the heavy low clouds, or the fogs seen from below, and the exquisite picture when seen from above. Nearly all of the water vapor in the atmosphere lies in the lower level, probably below the 5,000-meter level. We see this water vapor in the fog, which, from an aërophysicist's standpoint, is the lowermost of the clouds and nature's first step in rain-making. If we would thoroughly understand the processes of cloudy condensation in the free air we must follow closely the changes which the vapor of water undergoes, and whether the cooling which brings about the condensation is effected by an ascensional movement, or by contact, or by mixture. It is probable that mixture is the more active agency in the production of the fogs near San Francisco, inasmuch as we have a stream of air and vapor at a temperature of about 55° F. injected into a mass of air and water vapor with an average temperature of about 90°. The fogs probably result from sharp temperature contrasts at the boundaries of certain air currents. The contours of the land play an important part in originating and directing these draughts.

Vapor of water, then, existing independently of the air, appears to us as rain, fog, frost, hail, snow, and cloud from the lowest stratus to the highest cirrus, and it is also present in its invisible form to a greater or less degree, affecting us much more than we are aware of. A cubic foot of water vapor, when the dew-point is 40° F., weighs 2.85 grains. A cubic foot of dry air at 40° F. weighs nearly 553 grains. The two together, 556 grains. As the dew-point rises the weight of the vapor increases, but the weight of the air decreases; thus, at 50° F. the combined weight is 544 grains per cubic foot. As the dew-point falls the vapor weight decreases, but the weight of the air increases, and thus at 30° F. the combined weight would be 568 grains per cubic foot. Here, then, is the reason why we make use of water vapor to prevent frost. Every fruit-grower knows that frost is not likely to occur on cloudy nights. The chief reason is, of course, that the layer of cloud or water vapor serves as a screen to check the loss of heat from the earth by radiation, the chilling of the lower air, the increase in its weight and consequent slow settling or draining of the colder air by gravity to all low places. Therefore, we try in all frost-fighting devices to imitate nature and to make use of the vapor of water to hold in the earth's heat. Smudging devices may be described in brief as artificial fog-makers, and we see in the above a reason why frost occurs in streaks or in spots; also why damage may be done to fruit by low temperatures and yet but little frost be apparent, and conversely, when the dew-points are high and there is much water vapor, we may have heavy frosts, that is to say, the ground well whitened, although the air temperature may be 40°, with of course very little damage to fruit. These points are mentioned to answer questions, often raised by orchardists, why, with low temperatures, there is no frost, or why there is no frost one morning and there is frost on the next morning when the temperature is higher.

Back, then, of all discussions of wet and dry seasons in California lies the question of pressure distribution, the mean path of storms and the prevalence of south and southwest winds along the coast. Back of these, in turn, are the clouds—those plastic reservoirs that move in endless procession above our heads; and back of the clouds is the supply of water vapor. I have tried to-night to show its presence as invisible vapor over the surface of the sea; or as the fog with which we are all so familiar on this coast; or as the clouds of the lower, middle, and upper levels of the atmosphere; or as the frost, the friend and not the enemy of the fruit-grower; or as the snowflake in its symmetrical beauty; or as the rain falling on plain and mountain side; in brief, what the blood is to the human body, the vapor of water is to the inorganic world.

POST CHECK CURRENCY AND PARCELS-POST.

By M. V. HARTRANFT, of Los Angeles.

The present efficiency of the postal service is a matter of national pride. In many respects it has been marvelously developed, affording safe mailing facilities to the remotest mining camp and frontier settlement, while collections and deliveries in cities are made with astonishing rapidity and accuracy. In two particulars, however, there is still room for improvement. One is the safe transmission of money by mail; the other, the carriage of merchandise. The latter is a subject demanding special treatment, and is reserved for future discussion. I would, now, however, invite your attention to the defects and proposed improvements in the transmission of money by mail.

It is strange that Congress has never met the demand for a convenient postal currency for transaction of small business by mail. This demand is real, general, and has been long existent. The present postal money-order system is inadequate to meet it. The extent to which transmission of small sums is made by mail is enormous, and the inconvenience to which the public is subjected on account of the lack of a satisfactory medium for making these transactions is very great. However, this inconvenience is entirely inexcusable, for it could be very easily avoided by a simple, safe, and inexpensive system of postal paper. Why such a system has not been provided is not to be explained on any theory consistent with the inclination of Congress to serve the common interest of the people. It is unpardonable to subject the people of the country to such inefficiency and inconvenience when the remedy could be so readily provided.

A money order is tedious to obtain and difficult to get cashed. To get one requires a special, and often a very inconvenient, trip to the postoffice, the filling in of a blank, and possibly long waiting in line to reach the receiving clerk, making a cash payment and receiving an equivalent order, and all must be done within stated office hours. In the larger towns, especially, it is generally impossible to obtain an order after four o'clock. When an order has been obtained at this large expenditure of time and much exercise of patience, it is a safe means of sending money, but the question arises, Can not this safety be obtained in a very much simpler and easier way? That the general public has found the money-order system poorly adapted to the present commercial demands is shown by the fact that nineteen out of twenty letters, containing small remittances, inclose coins, loose bills, small checks, or postage stamps, instead of a money order. Most of these remittances are a direct incentive to theft on the part of mail clerks, and one of them, postage stamps, is not a money payment.

How to transmit money by mail, therefore, is one of the most important questions now before the public. One of the simplest, most comprehensible and feasible plans that has ever been devised, is known as the post check, and bills embodying the plan are now before Congress awaiting action. Mr. G. W. Post, the inventor of the post check, thus describes its origin:

"A number of years ago while executive of a manufacturing enterprise, my attention was directed to the loss of business caused by the difficulty customers experienced in sending small sums of money to us. Our manufactured articles were sold by merchants throughout the country, and in our advertisement the public was invited to purchase of merchants, or, if not thus obtainable, to order directly from the factory. In many thousands of cases, if the intending purchaser lived in the suburbs of a city, or in the country, or at an army post, or any similar place, remote from stores, he could not readily purchase, and therefore sought to secure the goods by mail. Our mail contained quantities of postage stamps, frequently mutilated or stuck to the letters, loose silver, paper money, and small checks. It was a serious matter to turn the great quantities of postage stamps into money. To get rid of them we were accustomed to inclose ten or twenty dollars in stamps, all we thought the payee would stand, when making remittances to pay our own bills; but the bulk of these stamps were sold to brokers or merchants at a discount of from three to six per cent. In many cases, soaking was required to free the stamps from the letter paper. Then followed re-gumming. This experience of one firm is multiplied by thousands.

"When a farmer or farmer's wife desires some article from the store or to subscribe for the local paper, or to transact any item of business requiring the expenditure of a small sum of money, he or she is stopped until such time as a journey can be made either to personally perform the duty or to secure a money order to safely convey the money. The great majority of people who might do business if remittances could be made easily, prefer to go without rather than subject themselves to the trouble and loss of time incident to securing a money order, and only the very persistent ones remit at all. In a vast majority of cases, the public is forced to adopt these unsafe and unsatisfactory forms of remittances in place of a money order. The difficulty of sending money easily and safely by mail without these annoyances and delays has been given serious consideration and has resulted in the post check currency plan that is now before Congress."

The post check plan contemplates conferring upon the currency of the country the dual properties of money and transmissible check. The plan is that, in the future, the $1, $2, and $5 government bills shall be engraved and printed with blank lines, on which the name and address of a payee may be written if desired. These bills will circulate as money, just as the present bills do, until some one wishes to remit by mail. Then the possessor fills in the necessary name, and by that act the bill ceases to be current money, but becomes instead a check payable only to the party named. If an error in addressing is made, the drawer can have it redeemed at his local postoffice upon identification. On receiving it the payee, upon identification, is paid its face value at any money-order postoffice. No journey to the postoffice is required to secure an order, as one merely converts the money in his pocket into a check. An issue of fractional currency provides for sending sums of less than one dollar. When converted into checks, a two-cent postage stamp is affixed to each bill of one dollar or more, and a one-cent stamp to each fractional bill, as a fee to cover the cost of reissue. As rapidly as the bills are purchased they are to be forwarded to Washington by the postmasters and new ones issued in their places.

To carry out this idea it is proposed that the bills of denominations of $5 and less shall, in future, bear the legend: "Payable to bearer on demand," as at present. The fractional paper currency will be issued in denominations of 5, 10, 25, and 50 cents in place of a corresponding money value of large government bills to be retired, presumably of $20 and $50, thus avoiding any disturbance in the circulating currency of the country. Nor is there any disturbance in the volume of the $1, $2, and $5 bills, as the post checks merely change the face of the present bills of these denominations and will be issued as rapidly as the present $1, $2, and $5 bills are sent in for redemption.

The continual redemption and reissue of these bills will keep the circulation at par. The rapidity with which they will be redeemed will keep them bright and clean, and the present loathsome condition of government paper money will be obviated. From a sanitary standpoint, the use of clean, crisp bills, in place of the foul, ill-smelling, disease-breeding notes now circulated, is a consummation devoutly to be wished.

It is thus seen that under the post check plan of currency no trip to the postoffice is necessary to obtain a safe, mailable remittance. It is instantly available. The money is used the same as money is used now to pay the grocer, landlord, and for every other use. Write a name upon it and it becomes a check, payable anywhere upon identification. Can anything be simpler, safer, or more complete? Under the present money-order system, safety can be assured only at the sacrifice of convenience, and convenience can be consulted only by disregarding the element of safety. The post check plan is both convenient and safe, and, being so, it is just what the public needs.

The history of the post check movement is interesting. The plan was originated and patented some years ago by Mr. C. W. Post, a wealthy manufacturer of Battle Creek, Michigan, and received considerable comment at the time, but it was not until February of this year that the matter was seriously pressed. Bills embodying the plan are now before Congress, one contemplating the re-issue of $1, $2, and $5 notes as above described, the other providing for fractional currency. The two ideas could not be embodied in one congressional bill, as the wording employed in the fractional currency bill necessarily differed in technical language from that authorizing the change in the face of the $1, $2, and $5 bills. The two bills, however, supplement each other and together round out and complete the system. These bills were introduced in the Senate by Senator McMillan, and in the House by Representative Gardner, both of Michigan. They were referred to the Senate and House Committees upon Postoffices and Post Roads, Senator Mason, of Illinois, chairman of the former, and Representative Loud, of California, chairman of the other. Senator Mason, as chairman of the committee, referred the bills to Postmaster-General Payne, for his opinion as to their practicability, and he, in conjunction with Secretary of the Treasury Shaw, appointed a joint committee of Postoffice and Treasury men, made up of the First, Second, and Third Assistant Postmasters-General for the Postoffice Department, the Treasurer of the United States, the Comptroller of the Currency, and the Auditor for the Postoffice Department, on the part of the Treasury. Several hearings were given, and Mr. Post in person explained the system in detail. Treasurer Roberts was made chairman of this committee. It was evident from the start that the chairman entered upon his duties with preconceived hostility, and he easily influenced the Comptroller of the Currency, who naturally deferred to a superior and more experienced official. The First Assistant Postmaster-General reflected the opposition of the money-order people, who have bitterly opposed the post check, as they foresee its adoption would annihilate the present money-order system. The Second Assistant Postmaster-General, although acknowledging the great merits of the post check plan, believed that a satisfactory system could be evolved within the Postoffice Department, and therefore somewhat reluctantly joined the others in an adverse report, thus making a majority.

Hon. H. A. Castle, Auditor for the Postoffice, and Hon. E. C. Madden, Third Assistant Postmaster-General, both men of long experience in postal affairs, were strongly in favor of the post check, and submitted a strong and convincing minority report in its favor. The Postmaster-General, in transmitting these reports back to the congressional committee, said that the post check idea was very simple, easily understood, and that if Congress in its wisdom should see fit to adopt it, provisions for carrying it out could undoubtedly be inaugurated. These reports were received so late in the last session of Congress that it was impossible to act upon them, and the entire matter went over to the present session. In his annual address to Congress this week, the Postmaster-General has strenuously urged immediate action on this measure.

The only opposition developed was found within the committee members and the bureaus, the Treasury people being disinclined to favor a currency which would add to the work of that department and the money-order department men fearing they would lose positions through the survival of the fittest.

The reports of this joint committee, however, are purely advisory. The committee had no legislative powers, and the matter is again before the congressional Committees on Postoffices and Post Roads, who have not yet reported to the Senate and House. The friends of the post check plan desire speedy action on the part of these congressional committees, that the matter may come up before Congress, and, upon favorable action, be adopted.

During the last session a very strong and widespread feeling in favor of the post check was developed in all sections of the country. The manifest defects of the money-order service were glaringly portrayed, and the inconvenience now suffered by the public was so emphasized that the necessity of reform in this important particular was acknowledged by both the Postoffice and Treasury Departments.

Great pressure is being brought upon Congress to secure the adoption of the post check. A flood of letters urging favorable action is pouring in upon Senators and Representatives from their constituents in all parts of the country; many leading business houses have indorsed it, commendatory resolutions have been passed by societies, and the newspapers are almost a unit in demanding it. The agitation is now being pressed with redoubled force, in order that the necessary legislation may be enacted at the present session of Congress. By all working together it is confidently hoped and expected that the desired result will be attained, and the people no longer debarred from a great public convenience through the captious opposition of a few bureau chiefs in Washington. To accomplish this, however, strong and persistent work must be done, and your active co-operation in this important movement is earnestly desired.

In conclusion, it should be said that no private gain is involved in the adoption of the post check, for the inventor has generously assigned his patent to the Government, free of cost upon adoption. He also has borne almost the entire expense of the agitation, finding sufficient reward for his financial sacrifice in the satisfaction of seeing the establishment of a great public utility.

The Parcels-Post.—With a modern system of postal currency so probable in the immediate future, consideration of the parcels-post is most opportune. Parcels-post is one of the governmental questions that our rapidly expanding commerce is going to force to public attention. Anything so reconstructive as this proposition is bound to meet with some determined opposition; hence, the retail merchants have quite generally entered into open opposition to the measure, fearing that it may mean a most serious blow to them, interfering with mail-order schemes. The economy to all industry in merchandising by mail is so great that I believe all opposition will soon cease. Parcels-post will never eliminate the retail merchant, and the expansion of trade caused by increased efficiency of service between producer and consumer means corresponding increase for the retail merchant.

The inauguration of the parcels-post means an expansion and an intensification of our internal commerce. Imagine the result of an opportunity proffered fruit-growers to send farm products in ten to twenty-pound packages direct to consumers through the postal system, at proper governmental rates. Think of the facility it affords manufacturers. One can readily see that it means the acute development of the commercial spirit among producers and manufacturers, who, by the medium of the mails, may trade direct anywhere in the country or abroad.

A straight line is the shortest distance between two points, and commerce develops most rapidly where the routes are less intricate and the methods most direct.

In a paper prepared for the North American Review, H. A. Castle, Auditor for the United States Postoffice Department, rebukes the demand for the parcels-post, because the rates would inflict an actual loss on the Government. The rates calculated upon are identical with the rates made by Germany and Great Britain. Can Mr. Castle show that the German government loses any such amount on the parcels-post arrangement? If not, we must surmise that the fault lies not with the parcels-post, but with the administration of our Postoffice Department. American commerce, to compete with English or German, must enjoy equal service by the Government.

The course for the Postal Department to pursue is to favor the introduction of the parcels-post at a rate which would not show loss to the Government. If it is argued that such a rate would be higher than charged by private enterprise, we are then forced to question the success of our Postoffice administration.

An indication of what might be expected from private enterprise, is shown in the following announcement by the Associated Press last summer:

> LONDON, Aug. 26.—Beginning September 1st, the postoffice of Great Britain will accept parcels for transmission to the United States. The various attempts of the British government to conclude a parcels-post arrangement with the United States having resulted in failure, the British postal department has arranged this independent service. The Cunard and White Star lines will convey the parcels to the United States and the American Express Company will deliver them in that country. The charges will be 24 cents for each three-pound package, and 72 cents for packages weighing from seven to eleven pounds, to principal points in the United States, with an additional charge of 24 cents for a British customs clearance fee. The United States customs fee will also be added. A similar parcels-post service is to be inaugurated from the United States to Great Britain. The weight and size limitations of parcels accepted under this service will be the same as those now controlling the British inland parcels-post, namely, a maximum weight of eleven pounds, and a maximum length of six feet for length and and girth combined.
>
> LONDON, Aug. 26.—The morning papers warmly welcome the arrangement for a parcels-post system between Great Britain and the United States as another link which draws the two countries together.

Good authorities said that this deal was frustrated because the plan would be a violation of the international postal union agreement. There has been no further development of the plan. Surely the United

States can, and should, make postal rates equal to any other country, and certainly the department should be able to make rates competitive with private corporations. Will they do it?

FRESNO GROWERS' DRIED FRUIT COMPANY.

By JOHN H. NOURSE, of Fresno,

President of the Fresno Growers' Dried Fruit Company.

The deciduous-fruit growers of Fresno have been undertaking something quite new in the way of co-operative marketing of their product. Last year, before the fruit was ripe on the trees, or before we could be sure that it had set, prices were quoted in the East at a very low figure. An estimate had been made, early in the season, of an enormous crop. I think most of us who were in a position to make estimates figured about three times as much as the preceding year, and prices were made accordingly. After the prices were sent out it was impossible to raise them. We heard that the southern country did not have a large crop, and knew that Fresno did not have, and also heard from other portions of the State, and did not believe it possible the remainder of the State could make up the shortage. We therefore determined to see if the growers of Fresno would not hold together in a speculative way, and we called meetings and appointed committees and passed resolutions, but nothing was done. The last meeting was pretty late in the season, and the people wished to drop the proposition, but five of us determined to hold together. But at that meeting there were about sixteen or seventeen who said they would hold together, and they elected five of us to act as directors, and we started the Fresno Growers' Dried Fruit Company. Each member has an equal interest, and every member has a vote, there being no cumulative voting. We realized in starting this that we could have no possible effect on the market at that time of the year, but we did feel that by incorporating we would gain a standing. We could show the rest of the State, in trying to get answers to our inquiries, that we wanted to help them as well as ourselves. We could get information and the Associated Press would take it up and we would be known in the East. If we incorporated, our first business was to find a place to handle our fruit. We were afraid we would not have enough, and did not dare to get a packing-house of our own, and we made arrangements with a co-operative packing company to receive our fruit, handle it, issue warehouse receipts, grade it, and in case we wanted it packed, we would pay a price agreed upon. We went to Selma and got a receiving place and found almost everybody had sold his fruit the week before, and we did not get nearly so much as we expected from there. I then went to Reedley, and found that out of fifteen carloads all had been sold but about two. Then I went down the line and found the same conditions. We did not have a large quantity this year, but we have the movement started and intend to have small organizations at each receiving place wherever there is enough to have co-operation. Then each company should be under a central organization. The local companies will attend to the packing and all such things that can be handled locally, and the central organization will attend to the selling of the fruit. We have found since that almost every successful co-operative proposition is running under these principles. We have sent out circulars containing our plan, and explaining the same. In every case the answers received are encouraging, and all have said that they are with us. In order to make it a success we have concluded that we will have to leave out prunes.

MR. JACOBS. This convention should certainly indorse such a movement, and I move you that this convention unqualifiedly indorse the organization Mr. Nourse is forming, the Fresno Growers' Dried Fruit Company, and wish it every success, and recommend the fruit-growers of this State to co-operate with them on similar lines.

Carried unanimously.

At this time a recess was taken until 9:30 o'clock Friday morning, December 5th.

PROCEEDINGS OF FOURTH DAY.

FRIDAY, December 5, 1902.

Convention met promptly at 9:30 A. M. Vice-President Wickson in the chair.

MR. NAFTZGER. I wish to offer the following explanation, and ask that the convention make it a part of the report of the Committee on Transportation:

Having never seen the tabulated statement which was offered as a part of the report of the Committee on Transportation, and having had no notice that it would be submitted as a part of the report, I wish to disclaim any responsibility for it. I had no part in its preparation and know nothing regarding its correctness.

MR. STEPHENS. I move that the wishes of Mr. Naftzger be complied with, and that what he has offered be adopted.

Motion carried.

MR. BERWICK. I have a resolution, which has been passed by the Committee on Resolutions, and which I would like to read. It is as follows:

Resolved, That this Convention of California Fruit-Growers assembled in San Francisco this 5th day of December, 1902, learns with friendly solicitude and deep regret of the protracted illness of Professor Douglas T. Fowler.

It takes this method of signifying to him its high appreciation of his earnest and valuable work in the past as Conductor of Farmers' Institutes on behalf of the University of California, as a leader in all movements tending toward the betterment of his fellow-citizens, and as an invaluable member of many former horticultural conventions.

Lastly, we trust that this assurance of our very high regard for his character and esteem for his personal worth, as shown in his work, may be a solace in his affliction and cheer him on his way to a speedy and happy recovery, and to a resumption of his untiring efforts on behalf of California's well-being.

That these resolutions be spread on our minutes and a copy thereof sent by our Secretary to Professor Fowler at the University of California.

The resolution offered by Mr. Berwick was adopted unanimously by a rising vote.

MR. GORDON. I have a resolution to offer in regard to the reclamation of lands from ruin caused by excessive irrigation:

Resolved, That this convention keenly appreciates the necessity for providing a way by which the drainage of districts including a number of land-owners, may be secured when necessary to render lands more productive, or to reclaim them from ruin by excess of water resulting from waste incidental to irrigation; and that it approves an appeal to the State Legislature to provide for the organization and operation of drainage districts as is done in other States.

Resolved, That a standing committee of five be appointed, with power to urge the subject upon the attention of the incoming Legislature.

On motion, the resolution was adopted and passed to the Committee on Legislation, and duly approved by it.

MR. JUDD. The Committee on Resolutions offers a resolution, as follows:

WHEREAS, The Division of Irrigation Investigations of the United States Department of Agriculture has been for several years, and is now, studying the problems connected with the use and distribution of irrigation water in California, including the complex questions of water titles and the drainage of lands ruined by over-irrigation; and

WHEREAS, These studies are of inestimable value to the agricultural and horticultural interests of California and the West;

Resolved, By the fruit-growers of California assembled in annual convention, this fourth day of December, 1902, that we urge upon Congress the desirability of adequate appropriations for continuing and extending the work of this Division, and respectfully petition the Honorable Secretary of Agriculture to increase the extent of the work of the Division in California.

Resolved, That copies of these resolutions be sent by the Secretary of the Convention, without delay, to the Honorable Secretary of Agriculture, the President pro tempore of the Senate, and the Speaker of the House of Representatives.

On motion, the resolution offered by Mr. Judd was adopted.

MR. JUDD. Your Committee on Resolutions recommends the passage of the resolution offered by Mr. Rodgers, regarding the Chinese exclusion law, as here given:

Resolved, That it is the sentiment of the fruit-growers of California, that the Chinese exclusion law should be so amended as to admit a restricted number of farm laborers.

MR. PILKINGTON. I move that a copy of the resolution be sent to both branches of Congress.

MR. NAFTZGER. I move to amend that motion to the extent that the exact vote of this convention be embodied in same, which was thirty-three for and twenty against.

Carried as amended.

CULTURAL TREATMENT OF ARID AND ALKALI SOILS.

BY PROF. E. W. HILGARD.

The difficulty of the average man in breaking loose from old traditions is forcibly illustrated in some of the cultural practices which, despite sad local experience, are still perpetuated in California, for the reason that our forefathers in Europe and in the eastern United States have found them good; regardless of the fact that circumstances alter cases, and that the prescriptions which have held good for centuries in the old country may be wholly out of place here in the arid regions, or may need to be materially modified in their application.

While it is true that the most ancient civilizations of the world have existed in arid countries, it is also true that the modern development of science and art has taken place almost wholly in the humid countries of Europe and America. Now, while the principles of both science and art must be the same everywhere, the *application* of the sciences bearing on agriculture to its practice must of necessity vary with differences of climate and soil, very much as does the natural vegetation. We shall vainly try to make the skunk-cabbage and may-apple of the East grow in California, no matter how much water we may supply them; and vice versa, the cactus and gray sage of the arid region will fail to thrive in the regions of forty and sixty inches of rainfall, unless artificially supplied with the conditions prevailing in their native home, not merely as to moisture, but also in respect to soil and air.

Our Eastern friends commiserate us on account of our being obliged to irrigate; and when they come here to live and farm their only idea is that as irrigation replaces rain, so soon as that is attended to the rest may be done just as it is done in the Atlantic States. That this frequently proves a costly delusion, need not be explained to Californians. But it seems necessary to call attention more pointedly to some of the points too frequently ignored or neglected, wherein our practice should and must materially differ from the Eastern, which unfortunately is still intuitively regarded, especially in the East, as the normal thing to be done everywhere, simply because the forefathers have "proved" it to be the right thing in their home. And I must admit that not only the farmers, but even the men of science have fallen into this rut, and will hardly believe that the natural conditions with us are so different from their "normal" ones, as to necessitate serious differences in practice. The indulgent smiles I have so often seen on the countenances of my scientific brethren in the East and in Europe, when insisting on these points, usually express the idea of a "California yarn," forgiven because of the influence of the climate upon the imaginations of those who dwell therein.

The most important differences in our farming practice as compared with the East, arise from the fact that, unlike the lands of the regions of summer rains, ours have in most cases practically nothing that properly corresponds to the "subsoil" of the Atlantic States. The Eastern subsoil differs from its surface soil in that almost always it is more dense or clayey than the surface soil; is practically destitute of humus or vegetable mold; and is "raw," that is, unfit for crop growth if it were on the surface. Hence, if in subsoil plowing it were turned up to any considerable extent, it would ordinarily mean the failure of at least one succeeding crop.

The formation of this clay subsoil is due primarily to the moist summer air and heavy rainfall. The former, as is well known, favors the formation of clay; heavy rains then form turbid clay water, which in soaking down is detained in the subsoil long enough to deposit most of its clay, and thus continually increases its heaviness. Hence, we usually find, in the East. the surface soils very much "lighter" than their subsoils.

But the same is not true of the bulk of our California soils. In by far the majority of cases, there is no sensible difference as to clayeyness between the surface soils and that immediately underlying the subsoil mass, often to depths of five and even ten feet. Clay forms very slowly in dry climates, and there are no beating rains to wash it into the subsoil. Hence, the latter remains porous, and both water and air penetrate freely and easily to great depths; and hence, again, the roots, which like the rest of the plant require the presence of both, also penetrate and exercise their vegetative functions at these depths, in the absorption not only of water but also of nourishment. For, in consequence of the penetration of air, the substrata are not "raw," as in the East, but contain available plant food throughout their mass; and normal humus, derived from the decay of the roots, is present to the depth of several feet. Instead, therefore, of being compelled to draw their nourishment from six to nine inches of surface soil, our trees can naturally feed upon five to ten feet of soil mass in our valley lands. Add to this advantage that of a natural supply of most kinds of plant food several times greater than in the average Eastern soil, and it certainly seems strange that the cry of fertilizers should be so early raised in the face of such natural advantages.

But the strangeness disappears when we examine the methods of both cultivation and irrigation now so commonly in vogue. By plowing to the same depth year after year, and irrigating frequently, in shallow furrows, we produce artificially the very same conditions which in the East produce the close subsoils, difficult to penetrate by air, water, and roots. In the East the impediment thus artificially created is called a *plowsole;* in California a new name has been invented for one form of it, viz., "irrigation hardpan"; and much ingenious speculation as to the cause, supposed to be a chemical change in the soil, has been indulged in.

In none of the cases that have come under my observation can there be any question as to the real origin of this trouble. Under the influence of the Eastern tradition, our farmers have been afraid to plow to more than the Eastern allowance of soil depth, uniformly, year after year; with irrigation furrows to the same depth, or less, and a tendency to irrigate as frequently as possible, in imitation of Eastern rains. One need only glance at the turbid water often seen in these furrows, and at the shining streaks behind the plow soon afterward, to understand that, in lands at all clayey, a solid plowsole will form here as in the East; the more, as few persons ever undertake to ascertain by actual examination how deep the irrigation water has penetrated during the time allowed by the zanjero. No wonder that, when a large part of the water runs off above the plowsole, despite the irrigation the deeper roots are often found to be in dry earth, and white-spotted leaves and "die-back" afflict the trees; while the soil above the "irrigation hardpan" is filled with white roots that should be active in the depths of the land, but within their limited range must needs be fed with fertilizers to take the place of the abundant supply that lies in the substrata, but is rendered unavailable by the plowsole.

There is, of course, no remedy for this evil except to break up the plowsole (gradually, if time permits), white roots and all; and to prevent the recurrence the land must, as should always be done, be plowed to different depths every alternate year. In doing this we need not hesitate, in nine cases out of ten in this State, to put in the plow to the full depth to which the team can pull it. And in order to avoid the excessive root-pruning that might thus be brought about, it is only necessary to put the irrigation water itself where it will do the most good; to wit, in *deep* furrows, from which it will soak down rapidly to wet the substrata, leaving the surface only moderately moist by soakage from below ("capillary ascent"), and causing the roots to descend into and utilize the entire soil mass, as do our native plants, instead of a paltry surface layer of twelve or fifteen inches only.

To put the matter plainly, the question is whether we shall aim to utilize the soil mainly in a horizontal direction only, or chiefly downward, or both. The former alternative is the one adopted by most of our irrigators at the present time, by the practice of shallow cultivation and equally shallow furrow-irrigation; the second was the choice of those who in early times practiced the original method of basin irrigation, in which the water was applied in circular basins, or rather trenches dug around the trees—a wholly different procedure from what has wrongly been so called of late, viz., the application of water in basins formed by throwing up a square levee around the trees and flooding the surface as well as the base of the trees. This is a kind of check irrigation, misapplied, where it will do the most harm by compacting the surface where it can not afterward be cultivated except by hand, and chilling the trunk and main roots so as sometimes to cause a dropping of the fruit.

Considering the frequent scantiness of the water-supply, especially in Southern California, I think there can be no question of the advisability of, in the first place, utilizing the water to the best advantage; and, secondly, preventing the tree roots from remaining close to the surface in white masses, like the corn roots in Eastern cornfields; when if water should not be available promptly during a hot spell, serious injury may quickly result. No such stress would arise if, in imitation of our native plants, the feeding roots were at such a depth below the surface that the heat and drought could not reach them within any brief delay in irrigation. In some localities they would not suffer materially without irrigation if their roots had been taught from the outset to descend into the moist depths of thoroughly winter-irrigated land.

Whether or not they shall do this depends entirely upon the treatment of the trees while young. If, in order to push their growth and bring them quickly into bearing, the orchardist starts in by manuring and irrigating them abundantly and frequently, in accordance with Eastern ideas, his trees will make Eastern, shallow roots, having no inducement to seek the depths of the soil. Such a root-system being once formed, the practice which brought them about must naturally be continued, with a wholly unnecessary, extravagant expenditure for both fertilizers and frequent irrigation. For what shall it profit a tree to have had the land thoroughly soaked in winter, whether from rains or from irrigation, if it has no roots sufficiently deep to utilize that stored moisture?

It seems to me that the advantage of a year's earlier bearing of an orange grove is very dearly paid for by such lifelong dependence on fertilization and punctual irrigation as we so commonly see now.

It is true that this condition is not irremediable, but has to be paid for by subsequent losses of crop resulting from the pruning off of the superficial roots, that must be done in order to aid the formation of a deep-root system. I say probable losses, because I have known cases in which no such loss followed the courageous adoption of a rational system of deep cultivation, and irrigation in deep furrows, few in number, from which the water soaks chiefly downward, where it is wanted, to store moisture out of reach of evaporation, and to cause the root to follow its lead.

But if an artificially formed hardpan or plowsole is bad, a natural one is worse, because usually it is of such a thickness that it can not be destroyed by any practically feasible means. Sometimes, in the case of orchards, it is feasible to shatter it by means of dynamite charges in tree holes, and this has served to relieve the situation in many localities in this State where otherwise no orchards would have been profitable.

Few persons outside of the Experiment Station can have an idea of the extent to which the planting of orchards on shallow soils underlaid by hardpan or heavy clays has caused pecuniary loss, often almost ruin, to old-timers as well as to new comers to the State. Every few days there come to us at Berkeley letters transmitting samples of tree branches having the "die-back," and asking about the means of relief. We might usefully stereotype the first letter in reply to such inquiries, briefly to the effect: "Examine your subsoil!" In nine cases out of ten, it is either hardpan or an impervious clay substratum which deflects the roots sidewise after the second or third year, and of course prevents a healthy, normal development toward the moist depths of the soil, where abundant plant food awaits them in all good orchard lands. More rarely it is a layer of coarse sand or gravel, which prevents the rise of moisture from below; sometimes it is the rise of bottom water, which causes the disease of the deeper roots, and also starves the tree. Almost invariably the question is asked: "What fertilizer must I apply to remedy the trouble?" Well, in most cases no fertilizer of any kind will remedy this difficulty, the existence of which should have been ascertained before planting the orchard; or better, before buying the land at all. Even in the East and in Europe careful farmers scrutinize the subsoil before investing. In the arid region this is tenfold more needful, because of the critical importance of the subsoil, over-shadowing that of the surface soil, as already explained. The irrigator who pays so dearly for his water is doubly interested in it, and ought always to know how long it takes water to soak to a certain depth in his land, so as to be sure that it does not run off the surface of natural or artificial hardpan, and flow to his neighbor below, instead of soaking down.

This seems to be such elementary common sense that it is difficult to understand how it is so widely neglected, despite the warning so emphatically conveyed by experience, and published by the Experiment Station for twenty years past. No farmer should be without that simple and cheap, though murderous looking implement, the soil-prod, which is so readily used. It is a steel rod three sixteenths to one fourth inch square, well pointed at one end, and provided at the other with a stout ring for a wooden cross handle, like the common auger. Length from four to five feet, preferably the latter; cost seventy-five cents. This is forced into the ground with a slight turning motion back and forth, hanging to it at first if one is of low stature. The farmer will be surprised at the new information conveyed by this simple process within the two or three minutes that it takes to make one sounding; and if any doubt remains at some point, the common post-hole auger may be made to supplement the prod. But with a little experience, the prod alone will suffice to tell the farmer, by the change in resistance, even how deep the irrigation water has penetrated in his land. And in many cases such information will astound him by its unexpectedness and make him understand why certain trees in his orchard have done so poorly, or so well.

In the case of alkali lands especially this test is most important. It will at once inform the farmer whether or not he has to deal with a "black alkali hardpan" at two or three feet depth, and if he does not find it he may be pretty sure that he has not to deal with that most injurious of alkali varieties, but only with the less injurious "white" sort. Then the main question will be how much there is of such alkali in the first four or five feet of the land; and that he can not readily determine himself unless the natural growth of the land gives the information, through the "alkali weeds," according to our Bulletin No. 128. If that is not the case, then the Experiment Station will help him, provided the soil samples are rightly taken; directions on this point will be sent on request, but in general I may say that we need at least the first four feet of the land; each separately, when convenient, but the average of a four-foot column will do. Ordinarily, very little alkali exists below four feet depth; exceptionally, as in the Imperial, or Colorado delta, region, there is another alkali-sodden layer at about ten feet, and still another at twenty or thereabouts. But these are not reached by the irrigation water, and their alkali does not rise to the surface as it usually will from the depth of four or five feet.

This rise is due to surface evaporation of the irrigation water; and, therefore, obviously the first thing needful in order to prevent the rise and accumulation of the salts at the surface where it will do most harm, is to diminish evaporation as much as possible. It is now well understood that the easiest way to accomplish this is to maintain the surface in loose tilth at all times; this alone will in very many cases prevent damage from alkali on lands not too heavily charged.

But this condition of loose tilth can not be maintained if irrigation is practiced by surface flooding, or in shallow furrows. It is true that surface flooding will in reasonably pervious soils carry the alkali salts down into the depths of the land, and, if long continued, into the subdrainage, if such exists. But unless flooding is done for that particular purpose, it usually serves to cause so much surface evaporation as to increase materially the amount near the surface, and so ultimately to render the land unfit for ordinary crops.

Irrigation in shallow furrows, so commonly practiced in our southern citrus orchards, produces much the same effect as flooding, as the land can not be cultivated for some time afterward; and so evaporation goes on for several days following irrigation. This can be readily avoided by using deep furrows, from which the water will rise only to the edges of the same, leaving the general surface dry, and permitting of the furrows being closed as soon as the water has soaked in, without danger of making a plowsole or "irrigation hardpan" by puddling the bottom of a wet furrow.

Our Great Valley offers an excellent example of what are the real needs of vegetation in a dry climate. It confirms fully the conclusion long since come to by General Powell, and set forth in his first report on the arid regions, viz., that twenty inches of rainfall may be taken as the limit of aridity in general. With us this limit lies about the city of Sacramento; all to southward should irrigate, all to northward can produce ordinary crops without it, fairly well; but, of course, the command of irrigation water is of capital importance even in the humid region, as a preventive of crop failures and an assurance of maximum crops. It is also notable that Sacramento forms nearly the limit of the alkali lands to northward; but they reappear under the lee of the Coast Ranges, where the rainfall is below twenty inches. That is to say, with more than twenty inches of rainfall the alkali salts are ordinarily washed into the country drainage; with less, they remain in the soil to worry the farmer, the more abundantly the less the rainfall.

It appears from our own best practice of irrigation that from twenty-four to thirty acre-inches of water can be made to suffice for most crops, although citrus trees will probably do better with thirty-six inches, taking both rainfall and irrigation into account. More than this is mostly unnecessary and represents waste in application. Yet, our neighbors in Arizona report that they require from five to five and a half acre-feet; that is to say, that they can irrigate with the water-supply at their command only half the area we would irrigate in California. Now, we may cheerfully admit that Arizona is drier and hotter than our Great Valley; but to claim that such an excess over and above what we find sufficient is really necessary with a rational use of water, means to deprive that territory of one half of the cultural area that might be rendered productive.

The four years of deficient rainfall from which we have suffered have rendered a reliable determination of the normal needs of irrigation water in our arid areas very difficult; but I do not believe that the above estimates are far from what will be found to be normally necessary if the proper methods are pursued. Upon these will depend, in a large measure, the question of alkali reclamation. If we can so use the water as to prevent its waste by surface evaporation, we will just to that extent suppress the rise of the alkali, and with this the majority of our alkali lands will become available for cultivation with the aid of gypsum where black alkali exists. There always will be tracts, the reclamation of which will not pay at present, when there is still so much good land unoccupied; but the intrinsic richness of all alkali soils will induce their ultimate redemption. In the meantime, those not very strong in salt content can be utilized and gradually reclaimed by the methods indicated in detail in the several bulletins issued by the California Experiment Station, provided only that irrigation water is used on them with a full understanding of how to do it and how not to do it; the latter being, unfortunately, but too commonly the prevailing practice.

ST. LOUIS EXPOSITION.

MR. ROWLEY. I wish to present a telegram from the St. Louis Universal Exposition:

St. Louis, Mo., December 2, 1902.

B. N. Rowley, *California Fruit-Growers' Convention, San Francisco:*

The St. Louis Universal Exposition extends cordial greeting, and assurance that the best facilities in many ways ever offered horticulturists will be provided them. I hope and expect that California will be well represented.

F. N. TAYLOR,
Acting Chief of Department of Horticulture.

MR. ROWLEY. In conformity with the telegram received from St. Louis, I offer the following resolution:

Whereas, The St. Louis Exposition is advertised to open in the spring of 1904, and it is uniformly conceded that at that time a grand opportunity will be offered horticulturists and fruit-growers to exhibit their products; therefore, be it

Resolved, That a committee of three be appointed by the Chairman of this convention, to be known as the Fruit-Growers' St. Louis Exposition Committee. That said committee is hereby authorized to promote and encourage in every way an exhibit of California fruits and fruit products at the St. Louis Exposition in 1904. That said committee be further authorized to confer and discuss with similar committees of other organizations the best means of accomplishing the desired end and securing funds for the purposes mentioned, and, if found necessary, to join with other organizations in drafting and presenting a bill to the incoming Legislature, asking for an appropriation for the proper and adequate representation of California and her industries at the St. Louis Exposition in 1904; and be it further

Resolved, That this committee act in conjunction with the State Board of Horticulture

Resolution adopted.

IRRIGATION AND DRAINAGE.

MR. DORE. I desire to offer the following resolution:

Resolved, That the California Fruit-Growers' Convention, held in San Francisco December 2 to 5, 1902, declares its earnest approval of the work accomplished during the last two years for the promotion of irrigation and drainage in California by the Irrigation Investigations Division of the United States Department of Agriculture under the direction of Elwood Meade. We desire to express our appreciation of the scientific care and accuracy of the investigations prosecuted in this State and of the high practical value of the results attained, and earnestly desire that the work be continued along the lines indicated by Professor Meade in his published reports and approved by Hon. James Wilson, Secretary of Agriculture.

Resolution adopted.

COMMITTEE ON PRESIDENT COOPER'S ADDRESS.

At this point President Cooper took the chair.

PRESIDENT COOPER. The standing committee to carry out the recommendations in the President's address, appointed at the last convention, is continued, as follows:

Gen. N. P. Chipman, of Red Bluff, chairman; F. N. Woods, San José;

H. Weinstock, Sacramento; A. H. Naftzger, Los Angeles; George P. Hall, San Diego; Frank Williams, Los Angeles; Senator S. C. Smith, Bakersfield; A. R. Briggs, Fresno; James A. Carr, Stockton.

POST CHECK SYSTEM AND PARCELS-POST.

MR. SPRAGUE. I offer the following resolution:

Resolved, That this twenty-seventh annual State Convention of the Fruit-Growers of California heartily approves of the plan for the establishment, by the United States Government, of the post check system and parcels-post, and earnestly urges our Senators and Representatives in Congress to do all in their power to effect this at the earliest possible date.

GRAPE-GROWING AND THE WINE INDUSTRY IN CALIFORNIA.

By PERCY T. MORGAN,
President California Wine Association.

Few agriculturists to-day have more reason for self-congratulation than the vineyardists in California.

Table grapes have given splendid financial returns for the past three years, raisin grapes have yielded satisfactory profits, while returns from wine grapes have brought money into the pockets and smiles to the faces of many who a few short years ago viewed the future with despairing hearts, and saw only bankruptcy ahead after years of investment, toil, and anxious hope.

In 1897, comparable to the present year for its unusually large grape yield, the vineyardist who obtained $8 to $10 per ton for his grapes delivered to the wineries considered himself a fortunate man, and so he was contrasted with many of his neighbors who could obtain no more than from $5 to $6 per ton. The abnormal yield that year amazed and paralyzed those engaged in the California wine industry. Dissensions were rife among wine-makers and dealers, which allowed of no cohesive action toward that temporary holding of stocks which alone was needed to sustain the market and permit a normal condition to reassert itself. Each vied with the other in a frantic endeavor to realize on the wines. Vineyardists, wine-makers, and merchants were rushing like a herd of stampeded animals toward a precipice of ruin; many went over, never to rise again; many were injured; and a few only, shying at the edge, pulled up in time to save themselves.

Meanwhile, California wines were like a football in the market. Consumers viewed with amazement and ridicule this spectacle of insane business procedure. No great increase in consumption resulted from the destructive war of prices, in which good, sound, merchantable wines were sacrificed, sometimes for less than the price of the cooperage which covered them. There was no organization, no sustaining hand to check the pandemonium of passion, prejudice, and panic which had engulfed the industry. Finally, when bottom had been reached, and ruin was staring every one in the face, reason began to reassert itself. A little quiet conference and sober thought revealed how absurd was the prevailing condition. The so-called "surplus of wine" was more sentimental than real. If some strong organization would take matters in hand the situation could easily be saved. Conference grew into action, and suddenly out of apparent chaos came order and prosperity, a prosperity which has continued in increasing ratio to this day, and, if the present conditions are not endangered by the very people who are most benefited, can continue indefinitely.

The present condition of the wine-grape industry is notable from the fact that it has contradicted the dire prediction that with the disintegration of the growers and wine-makers' co-operative effort, and with the ascendancy of the great dealers in the wine trade, the grape-grower might expect nothing but oppression and unfair treatment.

When each year grape prices steadily advanced these same prophets said: "It is because of the short crops; wait until a heavy crop occurs, and then see how the price of grapes will be depressed again below the cost of production."

We are just emerging from the largest crop of wine grapes to the acre of bearing vineyard that this State has ever seen, and those growers who are jingling the proceeds of their crop in good gold coin can testify whether there was any foundation for these pessimistic views.

The fact is that the great dealers are even more interested in stability of prices than the growers themselves; they are not benefited by violent fluctuations in price; the contrary is the case, for they do not sell the product of one vintage until long after the succeeding crop. They are, therefore, direct losers by any drop in price that affects the value of the stock of maturing wines, which, in order to conduct their business, they are compelled to carry.

But it has been fashionable to lay all the misfortunes and vicissitudes of the industry at the door of the merchants, in default perhaps of a better scapegoat, for it must be admitted that some scapegoat had to be found to account for the uncertainties and violent fluctuations of a business which, by reason of the generous protection afforded by a Republican tariff, should have shown the greatest stability.

In the past it has not been so much over-production of wine in a series of years that has caused these fluctuations, as the fact that there was no interest powerful enough to take care of the periodical over-average crop which occurs in all agricultural products.

An abnormal yield, therefore, always caused a depression, which influenced not only one but several succeeding vintages. Unless there be a guiding influence capable of commanding the financial backing to enable it to take care of and pay cash for the abnormal crop, and thus average the production through fat and lean years, and unless there be a community of interest which will permit of grower and merchant working together to allow the necessary concentration of capital a fair return for its risk and investment, then the old conditions must reassert themselves.

High prices are the greatest protection that capital has, provided the initial cost of the material does not exceed the market possibilities of a product; and provided, also, the grower and wine-maker do not, by entering the open market with new and unmatured wines, cause a lowering of prices and a deterioration of quality, which may be destructive to the industry. Unless forced by the competition of the smaller growers and wine-makers, the merchant never voluntarily depreciates the value of his stock on hand by lowering prices; it would be the height of insanity on his part to do so.

There are some people so constituted that they find cause for dissatisfaction no matter what the conditions, and who would find the beauties of heaven itself dim and insufficient. To these I do not address myself. But to the great majority who are reasonable, and who realize that they derive benefit by sharing in a general prosperity, I would propound the following query: Would you return to the old conditions when it was every one for himself and the devil take the hindmost—and he got quite a multitude—or are you satisfied to let well enough alone and co-operate reasonably, and heartily, and loyally with capital, which, while benefiting itself to a limited degree, is earnestly striving to put and keep the wine industry of California on a permanent and prosperous basis?

If you are, then plant your vineyards without hesitation or fear in the dry-wine districts of the bay counties, for the increasing trade should take care of the dry wine yield, if properly and intelligently held, as fast as vineyards can come into bearing.

Do not be too rash, however, in the interior sweet-wine counties, for the possibilities there of bringing vineyards quickly into bearing and the immense yield under irrigation, are so unlimited that no increase in consumption can keep pace with unrestricted planting.

To the wine-maker I say: Do not be too anxious to realize on your wines immediately after a generous vintage; that tends to create competition among yourselves, of which it is but human that the mercantile spirit will take advantage.

The market can no more take at sustained prices an amount exceeding its natural capacity than a water-pipe can carry off a flood. It is far better to hold your wines for the invariable crop shortage which follows for several years an abnormal yield. Your wines then will not have to seek a buyer, but, as in the past two years, the purchaser will be the more eager party, and will, through anxiety to maintain normal and necessary stocks of wine for aging and maturing, engender a competition which can not fail to insure the maintenance of values.

In an address at the annual banquet of the Manufacturers and Producers' Association two years ago I made the following remarks:

"No longer should it be a question of the survival of the most enduring; rather should the smallest vineyardist be encouraged, so that he may confidently plant resistant vines and be free from the ravages of phylloxera. Provided greed does not influence any of the constituent elements to demand an undue share in the division of the profits, the viticultural industry of California has, with the new century, entered upon an era of prosperity hitherto unequaled in its solidity. A policy of 'get all you can this year, and let the future take care of itself' is destructive to most permanent industries, and to none more than the viticultural industry. It takes many years to bring a vineyard into bearing, and it takes time to bring the wine to maturity. Therefore, it is not one year of abnormally high prices succeeded by two or three years of ruinous depression which the various elements composing the viticultural industry must strive for, but rather a period covering many years of steady prices. The industry must never again degenerate into a gambling affair more dangerous than speculation in wheat—which takes but one year to grow—or mining stocks, which depend mostly upon rumor or manipulation for their ups and downs—mostly downs. The merchant must not strive to make a weak market for the large crop so that he may hold it for a rise; nor, on the other hand, must the grower in years of lighter yield attempt to run up the price of grapes to figures at which a legitimate profit can not be realized by the wine-maker, the merchant, and the dealer. Both policies invite retaliation; retaliation means controversy, and controversy means ultimate ruin to all concerned. The viticultural industry has had its fill of controversy. Let peace now reign, and its concomitants, plenty and prosperity, will follow as naturally as water flows down hill. Let the various elements come together, talk together, work together. All want success, but let not the success of one spell disaster for the other. All can be prosperous if all will only co-operate, instead of each element regarding the other as its natural enemy or its natural prey. Therefore, let the maxim henceforth be fairness; fairness from the grower to the wine-maker, the wine-maker to the merchant, and the merchant to both grower and wine-maker. Let each sink selfish interests in the endeavor to make all prosperous. Allow a fair return to the grower for his toil; to the wine-maker for his risk and skill in wine-making; to the merchant and his financial backers for the millions necessary to hold, mature, and find remunerative markets for the product; to the dealer for his energy and push in distributing to consumers; and to the consumer in the good quality and reasonable price of his beverage, so that the increase in consumption may continue unchecked."

How far the large merchants with their financial backers have carried out their side of this compact the vineyardist can best answer in the light of his lessening mortgage or increase in the balance at his bank.

In closing, I desire to repeat warnings which I have before sounded.

Something that must be avoided in the interest of all concerned is putting up the price of the common grade of wine to too high a figure. We do not want to limit our consumption; we need the expanding markets to take care of any increase in the acreage, and thus by natural causes maintain a proper equilibrium. A reasonable and standard price for a standard article will do more to secure a continuance of prosperity to the wine industry of California than will violent fluctuations.

It is safer to be satisfied with reasonable prices which will provide a good return to the grower than to fix for a year or two abnormally high prices, which can only result in loss of trade for California wines, to regain which a fight will be necessary when normal conditions reassert themselves.

Our Senators and Congressmen, and the Senators and Congressmen of other States who are friendly to us and to the wine industry of the United States, must be instructed, written to, conjured, and beseeched to be on their guard against the so-called reciprocity treaties. If you will notice, in almost every one of them the wine industry is made the victim; if it is Portugal, or France, or Germany, or Italy, or any other country to be conciliated, the first victim for the sacrifice that comes to the mind of the Administration appears to be the wine industry. Only the other day the newspapers recorded the fact that into our new possession, Porto Rico, the wines of Portugal were to have reciprocal advantages. This is a direct blow to California, for after paying the heavy expense for cooperage and the freight on wines to Porto Rico, California is little better off with the reduced tariff, in competition with the cheap surplus from Europe, than if no tariff existed.

We have been looking to the new territories acquired by the United States and to the Cuban field for a market in which our industry could find expansion. But, unfortunately, we are regarded in Washington as a distant and politically unimportant corner of this great country. Able men who could politically benefit us by reason of their experience and acquaintance with the intricacies of legislation are seldom allowed by the people of California to retain their seats in Congress for more than one or two terms. New "isms" of all kinds are apparently more favored by the people of California than are the interests of their great State. They appear to think that they can continually change their representatives in Congress and then expect to obtain any recognition from "the powers that be," when experience has demonstrated that until a man has been in Congress for several sessions he is as valueless in guiding legislation as a ship without a rudder.

The people and the growers of California are more to blame for the scant regard which is given to California interests in Washington than is the Administration. The magnificent and upright man who now graces the Presidential chair can not be expected to absorb by intuition conditions which affect every corner of this vast country, and unless these conditions are brought to his attention, and to the attention of Congress through the proper congressional channels by men whose long acquaintance with their colleagues can compel favorable attention, the President can not be expected to know that here on the Pacific Coast we have a tariff in the shape of railroad freights on cooperage stock west bound, and on wine east bound, which goes a long way toward neutralizing the customs tariff on wines landed on our Eastern seaboard from abroad at prices initially so low that an attempt to compete would starve and destroy the California wine industry.

No great things are accomplished without working for them; but Californians appear to think that by some God-given influence favors are to be bestowed upon them without their even asking for them.

It may be that the climate and ease of living in California have made us indolent, but I say to you people of California that if you do not wake up and make yourselves heard you will find yourselves distanced by the more energetic, self-assertive, cohesive, and unit-acting people of other sections, and after the harm is done you will be crying out and blaming everybody and everything except yourselves for the conditions for which you alone are responsible and blamable.

MR. GORDON. I have a report of the Committee on Legislation to the effect that we approve of the passage of the resolution regarding the reclamation of lands from ruin by excess of water resulting from waste incidental to irrigation.

Report adopted.

MR. JACOBS. I wish to make a motion in regard to reciprocity, on which action is liable to be taken in some particulars within the next few days. I move that the Secretary send communications to all commercial bodies asking them to take up the subject, and protesting against any reciprocity treaty that will affect the interests of California unfavorably.

Motion carried.

PRESIDENT COOPER. I will appoint the following committee of seven to organize local associations to centralize and conduct a sales agency for perishable products in the San Francisco market:

A. R. Sprague, Sacramento; A. T. J. Reynolds, Sacramento River;

A. N. Judd, Pajaro Valley; John Swett, Martinez; William Barry, Alameda; A. N. Morse, Stockton; J. W. Reams, Suisun.

The resolution offered by Mr. A. N. Judd, recommending an appropriation of $20,000 to carry on the investigations regarding pests, was referred to the Committee on Legislation.

PRESIDENT COOPER. I will name the following committees:

On Exhibits in this Hall—John Rock, George C. Roeding, and A. R. Sprague.

On Nomenclature—John Rock, Professor E. J. Wickson, George C. Roeding, A. P. Griffith, H. P. Stiles, J. F. Cutter, and Leonard Coates.

PRESIDENT COOPER. A resolution was passed asking the State Board of Horticulture to have two meetings each year instead of one, one in the spring in the south, and the other about the same time as we had this, for the north. If there are any Los Angeles people who are anxious to have a spring meeting held in Southern California, they will have to manifest it by at least showing that they will exert themselves and see that we have a good meeting.

MR. HARTRANFT. I can assure you that we will do all in our power to give you a good meeting, and I extend an earnest invitation to the State Board of Horticulture to have a spring meeting at that place.

MR. DORE. In regard to the next annual meeting, I can think of no better place for the meeting than Fresno. We will do all in our power to give you a good meeting, even much better than we had when you were last there.

PRESIDENT COOPER. The places for holding the meetings will be determined by the State Board of Horticulture. It makes no difference to the Board where these meetings are held, but we decided to hold the last three meetings in San Francisco, as we desired to have the railroad officials present with us. Those of you who wish to place your respective localities in nomination for the next meeting will please address such a communication to the State Board of Horticulture, and we will then choose the place.

An adjournment was then taken until 8 o'clock in the evening, in order to allow the members of the convention an opportunity to accept of the invitation to visit the State University at Berkeley this afternoon.

EVENING SESSION—FOURTH DAY.

FRIDAY, December 5, 1902.

Convention called to order promptly at 8 o'clock P. M. President Cooper in the chair.

ADAPTATION OF RESISTANT STOCKS TO CALIFORNIA CONDITIONS.

BY PROF. E. H. TWIGHT, OF BERKELEY.

In a retrospective survey of the early history of the reconstitution of French phylloxera-devasted vineyards on American resistant roots, no feature is more conspicuous than the numerous failures recorded. These failures arose from very varied causes, among others: almost complete ignorance as to the class of soil in which the American vines grew naturally; want of practical information with regard to their grafting affinities with European stock; uncertainty in respect to the varieties and even species planted, their doubtful resistance and occasional negative resistance to strong attacks of the phylloxera, and finally adherence to the old methods of shallow preparatory cultivation in creating new vineyards.

We find to-day the same things to be overcome in California, with this point in our favor, that we have the past experience of other countries to lead us in the solution of those problems.

If we study the conditions of adaptation of resistant stocks in our California soils, we find that one of the most important factors which had to be overcome in many vineyard districts of Europe will not cause us any trouble. "Chlorosis," the disease caused by the presence of an excess of lime in the soil, has not to be dealt with, for our California soils, as a very general rule, do not contain carbonate of lime in any injurious quantities.

What we have to deal with in the choice of our resistant roots is: the compactness of the soil; the conditions of moisture; the fertility of the land; in some districts the amount of alkali contained in the soil.

The compactness of the soil, generally due to an excess of clay, is an obstacle to the growth of many varieties of resistant stock; their roots do not penetrate easily, the ground is cold and often wet, and the Rupestris and Riparia, for instance, do poorly under those conditions. On the contrary, the Lenoir, Champini, Riparia × Rupestris 3306 and 101^{14} will do well; the Solonis × Cordifolia-Rupestris 202^{4} will do still better. The last three varieties (3306, 101^{14}, and 202^{4}), having a higher resistance to phylloxera, should be our choice. If we examine the probable cause for that special adaptation to heavy soils, we find that the varieties growing better in heavy soils have larger and more fleshy roots than we find in the Rupestris or Riparias.

The moisture, when in excess, is also an important factor in adaptation, as it checks the growth of the radicular system. Vines growing in a very moist place may have a vigorous aerial growth, but the root-system is generally weak; such a vine will suffer greatly if for some reason the supply of moisture should fall below the average. On the other hand, a moist soil will help a vine in its fight against the phylloxera, and we may see in such conditions a stock inferior in resistance do fairly well. As a general rule, the Solonis hybrids or the Solonis itself is good in such soils. Among the most promising hybrids of Solonis are the Solonis × Riparia 1615 and 1616 and the Solonis × Cordifolia-Rupestris 202^4; they are far more resistant than the straight Solonis.

The fertility of the soil is a condition affecting adaptation that we can not overlook; a Riparia or a Solonis will turn yellow and sick in a soil where a Rupestris could do fairly well. This does not mean that a Rupestris will not do better in a good soil than in a poor one, but simply that it is more rustic in its adaptation.

I do not intend going over the value of the resistant stocks that have been commonly used in California (Riparias, Rupestris, Lenoir, Solonis); they are fairly well known, though their adaptation does not seem very clear in the mind of many. We see every day Riparias planted on gravelly hillsides where Rupestris should be used; Rupestris or Riparias planted on stiff clays where Lenoir would be superior, or on moist locations where the Solonis would be better adapted. What I want to call your attention to is the numerous valuable stocks well adapted, probably, to some of our difficult soils and that have only recently made their appearance on our nurseries catalogues, though they are thoroughly known now in other countries.

Those resistant stocks are hybrids that have been obtained by crossing varieties to try and widen the range of adaptation or to increase the resistance of some varieties. In creating those hybrids, at first the object was to take a Vinifera vine (such as Carignane), cross it with a resistant (such as Rupestris), and obtain a direct producer (Carignane × Rupestris) that would be resistant and would not need grafting. The results in that direction have been fairly good regarding the resistance of the stocks obtained, but not in the bearing qualities. At the same time, by crossing American varieties good results were obtained in bringing in the qualities of some stocks that were before considered as valueless on account of the difficulty to make them grow from cuttings or to graft them. Thus, the *Vitis candicans*, the *Vitis cordifolia*, and the *Vitis berlandieri* crossed with easily-rooted varieties such as Riparia, Rupestris, and Solonis, gave some stocks which in compact, in moist, and in dry conditions proved to be very valuable. The hybrids of Riparia × Rupestris also gave very good stocks.

Two classes have been created: the Vinifera-Americans and the Americo-Americans.

The Vinifera-Americans are hybrids between our actual wine and table grapes and resistant stocks.

The Americo-Americans are hybrids between two or more resistant stocks.

They are not supposed to displace the ordinary stock, but to take their place in locations more difficult to reëstablish.

DRY LOCATIONS.

Vinifera-Americans.	*Americo-Americans.*
Bourrisquou × Rupestris 603.	Rupestris du Lot.
Pinot × Rupestris 1305.	Riparia × Rupestris 3309.
Carignane × Rupestris 501.	Riparia × Cordifolia-Rupestris 106^8.
Cabernet × Rupestris 33A.	
WET SOILS.	
Mourvedre × Rupestris 1202.	Solonis × Riparia 1616.
Aramon × Rupestris 1.	Solonis × Cordifolia-Rupestris 202^4.
COMPACT SOILS.	
Aramon × Rupestris 1.	Solonis × Cordifolia-Rupestris 202^4.
Bourrisquou × Rupestris 601.	Riparia × Rupestris 3306 and 101^{14}.
Mourvedre × Rupestris 1202.	Riparia × Cordifolia-Rupestris 106^8.

This table shows some of the soils in which hybrids may be very useful; certain hybrids, such as those of Riparia × Rupestris, may displace entirely the Riparia and Rupestris, on account of their wider range of adaptation and affinity.

In both groups of Americo-American and Vinifera-American hybrids we can find some varieties well adapted to our special condition; in both, we find a good resistance to phylloxera in the selected numbers of stock. Which should we plant in our vineyards?

It may be said in a general way that the Americo-American hybrids, as well as the ordinary American stocks, make the Vinifera scions that are grafted on them bear more heavily than they would if they were on their own roots. They come into full bearing earlier, and generally the fruit will also ripen a few days earlier. The grapes may be a little lower in sugar than when growing on their own stock, and some authorities claim that the flavor may be affected slightly. The heavy bearing of the vines grafted on these stocks will exhaust the land sooner, so that fertilizing will have to be resorted to earlier, and it is a known fact that heavy fertilization affects the quality of the grapes.

On Vinifera-American roots the scions of Vinifera after grafting give about the same results as on their own roots.

From these remarks we may conclude that the American resistant stocks and their direct hybrids will probably be favored by those who look to quantity more than to quality; while for the fancy wine grapes, table grapes, or raisin grapes, Vinifera-American may be chosen. The choice between the two groups is mainly an economic question.

All these varieties, together with several of Mr. Munson's varieties, have been tested in other countries with satisfactory results. We need them for many of our soils. We have adobe soils which remain wet; others that dry up and crack; we have sandy lands, white ash lands, gravelly lands, which should be investigated. We have lost already many valuable years. I would like to impress on this convention the need of creating experimental plots to test the adaptation and affinity of a collection of resistant stocks to such an extent that we might say to each vineyardist, when his time comes to replant: this is the stock adapted to your land, so that he will not run any risk of losing again his vineyard. With more than two hundred thousand acres planted in vineyards and valued at from forty to fifty million dollars; with twenty-five or thirty more millions invested in wineries, packing-houses, and driers, making a total of from sixty-five to eighty million dollars invested in the viticultural interests of the State of California, and representing over one half of the total viticultural interests of the United States, we ought to be able to keep ahead, or at least to protect ourselves.

Phylloxera is spreading gradually from north to south; it is nearing the Tehachapi. All California viticulturists, whether wine men, grape men, or raisin men, ought to see that their interests are protected. Our viticultural department of the State University ought to have an appropriation that would enable it to carry on that work; to establish stations for the study of resistant stock; to study new methods of vinification, etc. Australia and Cape Colony are doing more with their limited area of vineyards than we are.

I hope that this convention will see the importance of these investigations and use its influence to see that they are carried out.

DISCUSSION ON VINE DISEASES.

MR. DORE. In the spread of phylloxera, is it your opinion that it is moving toward Fresno? Your language would imply that it had not yet reached that county, but that we were in great danger.

PROF. TWIGHT. The phylloxera is in Fresno County, and we made a map of the phylloxera district there, showing at that time that it covered a strip of country about two and a half miles wide and four miles long, which is a pretty good-sized piece of territory for a starter.

MR. DORE. Does it seem to destroy the vine there as rapidly as in other districts?

PROF. TWIGHT. No, sir; because the most of the land where the phylloxera is, is a sandy loam, and the vine can send out a large quantity of small roots to replace the roots destroyed by phylloxera. Hence, the spread is slower there than in some of the other districts.

MR. DORE. Have you seen any of the Fresno vines that have been rendered absolutely unproductive on account of phylloxera?

PROF. TWIGHT. Yes, sir; two or three hundred acres.

A MEMBER. Can you tell us anything about the Anaheim disease—to what territory it is confined?

PROF. TWIGHT. What I know regarding the Anaheim disease is what I have learned through the report of Dr. Pierce. That report would be a valuable one for you to read. There is yet some dispute as to just what the Anaheim disease is.

A MEMBER. Mr. Hill, of Sonoma County, claims that the disease is in that county, and he has circulated a petition to start an experiment station there.

MR. DORE. Is it easy to determine when that disease is present?

PROF. TWIGHT, No, sir; because we don't know to-day just what Anaheim disease is. There has never been any germ found, and there has been no fungus or bacteria found in the different tissues of the stem or in the grape. It simply seems to be a physiological disease. When a vine has it, we only know that it is a sick vine, and that is all.

A MEMBER. What variety of resistant stocks would succeed the best in the vicinity of Fresno.

PROF. TWIGHT. Well, around Fresno you have a great many different soils.

A MEMBER. I mean in the sandy loam.

PROF. TWIGHT. I think the Rupestris St. George or the Riparia would do well. I have seen them grow in that district on the east side where those sandy loams are, and really I have not seen much difference between those two. They both seem to do well.

A MEMBER. Can you tell us to what extent the phylloxera has affected the Santa Clara Valley?

PROF. TWIGHT. Well, that is a very difficult point, for the reason that within the last two or three years the so-called Santa Clara disease has disappeared, and how much the phylloxera has helped to destroy the vineyards is hard to determine. If you read our report on the conditions in Santa Clara, you will see that we lay the main reason of the difficulty there to the lack of moisture in the lower layers of the soil; if a plant is suffering from a lack of moisture, and phylloxera attacks it, that plant will die very quickly. In a great many vineyards examined the roots were covered with phylloxera, showing that the two causes, the Santa Clara disease and the phylloxera, had been working together and had caused the damage.

HARVESTING, PACKING, AND MARKETING THE CALIMYRNA FIG.

By GEORGE C. ROEDING, of Fresno.

Smyrna fig culture has now reached a stage in its development, that to-day all who have expressed doubts as to the ultimate success of the venture are convinced that the industry has come to stay. All that is now necessary to cause it to become one of the great industries of our glorious State is the planting of the trees in sections adapted to their culture.

No variety of deciduous fruit tree will adapt itself to such a wide range of soils and locations as the fig, and the Smyrna fig is no exception to this rule. The common varieties of white figs so largely shipped to the Eastern markets to-day, and which have been in demand where the imported Smyrna figs are scarce, must finally give way to the superior Smyrna fig. Their general inferiority is conceded by all fruit-dealers, and were it not for the fact that they are sold at very low prices, there would be no demand for them in our markets.

California has become known now as an exporter of high-grade dried fruits, and to-day she is exporting her prunes into France and other sections of Europe, where a few years ago the possibility of California prunes, peaches, and apricots being sought after in those markets would have been considered highly improbable. It is now universally conceded that California dried fruits are far sweeter than those produced in Europe, and this, combined with our improved methods of handling, will before many years give California a prestige as the great fruit section of the world and her fruit will be in demand in countries which now depend solely on Europe for their supply.

Having reached the top of the ladder in the marketing of other lines of fruit, why should she not, within a space of a few years, overcome all difficulties, and gain the same prestige for her dried figs as for her other products? So long as only an inferior article in figs is placed on the market, there is no possibilty of reaching the goal as leaders. No people were so prone to condemn California products as the importers in the large cities on the Atlantic seaboard. They regarded everything coming from California with disfavor and suspicion, and were always the first ones to throw cold water on any new venture in the horticultural or viticultural line.

An enterprising man in California, who had probably invested his all in promoting a new industry, would be informed, when he had his product ready for the market, that it was so inferior to the same line of imported goods that there was no possibility of disposing of it except at ruinous prices. Unless he had the courage of his convictions, and the wherewith to continue his efforts and beat down the prejudice and general antipathy existing among the men who should have accorded him a helping hand, he was invariably forced to the wall.

These conditions had to be overcome by our deciduous fruit, orange, and lemon growers, and by our wine-makers and raisin vineyardists. The perseverance of these men, and the persistence with which they applied themselves in overcoming the obstructions placed in their paths, is another illustration of the pluck, push, and determination exhibited by our Western men. Notwithstanding they had to contend with high wages for labor, lack of experience, and high freight rates to the Eastern markets, as compared with the same conditions in the old countries, they finally triumphed. To-day the very products which our Eastern importer jeered at, are in active demand, not only to be disposed of in the Eastern and Middle States, but to be exported to the Old Country as well.

The fig business has been placed on a somewhat different footing. The fruit-growers of California have been forced to admit that their dried figs were far inferior to the fig of commerce. In this case the Eastern buyer had good reason for discrediting the future of fig culture in this State.

Cuttings of figs have been imported from Smyrna for a period extending over twenty-five years. These cuttings were widely distributed in many sections of the State. The trees grew and thrived, and seemed to be very much at home, but although they bore heavily, failed to mature their fruits. The greater part of them were dug up and destroyed, the growers having been forced to the conclusion that either they had been imposed on in the matter of the variety, or the climatic conditions were unfavorable for the success of the industry.

This state of affairs was still more forcibly impressed on the growers by the rumors which were occasionally wafted across the water from Smyrna, that even in Asia Minor there was only one section which could grow these figs with any degree of success. Cuttings had been sent to other countries bordering along the Mediterranean, and attempts had been made to grow these same figs in localities in Asia Minor, where conditions seemed to be favorable for their culture, but the dried figs were of so inferior a quality that further attempts were considered useless, and their culture was abandoned.

To this very day the fig-packers of Smyrna are sanguine that they will always control the Smyrna fig trade. They say that all attempts to produce the figs in other countries have invariably ended in failure. They scoff at the idea of California ever becoming a competitor in this particular line. They certainly voice the sentiments of some of the importers in the East, although many of these men are beginning to appreciate the fact that California can produce a good fig and that there is yet a possibility of our competing with the fig of commerce.

The year 1900 inaugurated the first production of Smyrna figs in California on a commercial scale, the crop at that time amounting to something over six tons. That the output was not larger was due to an insufficient supply of capri figs to fertilize the entire orchard. The first season's crop was put up in ten-pound boxes, in a manner similar to the ordinary California fig. Considerable difficulty was experienced in disposing of the crop that season, as the dealers were loth to believe that these figs, quoted so much higher than the ordinary figs, were of superior quality. From the experience gained the first season, I became convinced that the figs must be put up in an entirely distinctive package to impress dealers and consumers alike that they were getting something better than the ordinary California figs.

Fully appreciating that not only would the package have to be distinct and attractive in itself, but also that a name would have to be given to the fig to distinguish it from the imported article, and to prevent unscrupulous packers in this State from packing the common Adriatic figs under the same brand, and thus bringing the infant industry into disrepute from the very outset, it was decided to offer a premium for the most euphonious and appropriate name for the "California Smyrna fig." In response to an advertisement in several of the horticultural papers, hundreds of names were received. The word "Calimyrna" seemed to answer the requirements better than any other name submitted, being a combination of the two words California and Smyrna.

In the year 1901, for the first time in the history of fig industry in the State, figs were packed in cartons, in half-pound and one-pound packages. The package in itself was neat and original, having a green background, with the name "Calimyrna Figs" embossed in gold letters on the top of the box. On one side of the carton, the name of the grower and packer was engraved, and on the other, a view of the orchard and residence of the Fancher Creek Nursery.

The trade took kindly to this package; its attractiveness and originality having done more than anything else to convince the dealers that in purchasing these figs they were securing an article of far superior quality to the common white figs.

No great efforts were made during last season to market the figs in the Eastern States, although a limited quantity of them was distributed among the dealers in all of the largest cities. Very favorable comments were made wherever the figs were offered for sale, and the dealers and public alike were compelled to admit that there was a probability of California rivaling Smyrna in the production of a high-grade fig.

In my opinion, the most important step in connection with the future development of the industry was to distribute the figs as widely as possible in this State, and in the adjoining States and Territories with climates similar to our own. Our own people were first to be convinced that the growing of Calimyrna figs was destined to be a great industry, and seeing and sampling the figs were the only means of making them appreciate this fact.

The Eastern trade had not been solicited to buy heavily, first, because a few large concerns could absorb the entire product; and secondly, because the very idea of having the industry grow and develop rapidly would fail if this plan was carried out. In many of the large cities, the trade already knows what the Calimyrna fig is, and they are willing to admit that California is capable of producing a luscious fig, sweeter than the imported and of superior flavor.

All that remains for the horticulturists of this State to do, is to enter into the business of fig-growing, using the same intelligence and care that have been exercised in other lines to make the culture of this fig fully as important and probably more profitable than other lines of fruit-growing, which in some seasons are overdone, when the crop is heavy.

In the season of 1901, the one-pound cartons were put up in cases of forty-eight packages each, and the half-pound cartons in cases holding ninety-six. This was found to be a rather large and heavy box to handle, the trade demanding smaller boxes. It was deemed advisable to make a change in the boxes this season, so a box holding ten one-pound cartons or twenty half-pound cartons was adopted in place of the larger box. This box is in many respects superior to the old style, is more easily handled, the cartons are displayed to better advantage, and last, but not least, the boxes are of convenient size for shipment to Eastern friends.

The active demand for the Calimyrna figs, at more than double the price at which the Adriatic figs sell, is sufficient evidence of the esteem in which the figs are held. The Calimyrna sells side by side with the very best grade of "Elemé" figs, and if anything many of the leading grocers of the State, handling both classes of goods, have given the Calimyrna the preference. Notwithstanding this, there is an inclination on the part of some dealers to favor the imported article.

A rather laughable incident occurred in one of the largest grocery houses in San Francisco recently, and aptly illustrates how easily a slight prejudice will influence a man's views. The Calimyrna and some new crop of the imported Smyrna figs were being compared. The grocer insisted that the imported figs were the better of the two, although he admitted that the home-grown figs were excellent. Failing to agree in the matter, I finally suggested that each of us select a fig, and allow another member of the firm to decide which was the better of the two. The results were rather amusing, and gratifying to me, but not so much so to the other interested party. Selecting and sampling my fig first, the gentleman remarked without a moment's hesitation, the "Cream of the Cream," the genuine imported article, while the imported fig was referred to in rather disparaging manner as being Roeding's. This is only another illustration of the preference given to anything in the imported line over the home product, and is an instance of a few of the difficulties any one engaged in a new industry has to contend with.

Harvesting.—No crop of fruit is so inexpensively handled as the Smyrna fig. The figs, when mature, drop from the trees of their own accord, and those which do not fall will drop as soon as the tree is given a slight shaking. The proper stage of maturity is indicated by the fig having lost its form and hanging limp and shriveled on the tree. If gathered before it reaches this stage, the resultant product is without flavor and substance and lacks that sweet, delicious, aromatic, nutty flavor found in a properly dried Calimyrna fig. It is generally supposed that the Smyrna figs are insipid before they are dried; but this is a mistake, for no other class of figs possesses the rich, sugary aroma and syrupy sweetness found in these figs.

The Calimyrna, which is identical with the "Lop Injir" (meaning sweet fig) of Asia Minor, has been found superior to the other varieties grown at the Fancher Creek Nurseries, for marketing in the fresh state; while for drying, its value can not be questioned.

Seedlings may eventually be produced, which may prove to be of greater value for commercial purposes than the Calimyrna, but until such a fig is developed, the Calimyrna will unquestionably be the standard bearer in the fig line, just as the Washington Navel orange holds the lead among the oranges.

The "Lop Injir" is the only variety planted in the Meander Valley for commercial purposes; in fact, it is the only one, except for occasional mixtures in the orchards, to be found in the entire fig district. This fig, in the fresh state, is large to very large, about two and one half to three inches wide, and from two to two and one half inches long; very short neck and very much flattened at the apex; skin lemon yellow; ribs distinct; orifice large, of pale ochre color, and widely open when the fig is mature and before shriveling; pulp reddish amber, turning to dark amber just before falling; seeds large, yellow, fertile, overspread with clear white syrup.

When the figs drop, they are gathered in buckets, and are then dumped into picking boxes, which later on are taken to the drying grounds. Before being placed on the trays, they are immersed in a boiling hot brine, which softens the skins, gives them a glossy appearance, and hastens drying. In placing the figs on the trays, no care is taken to have them lie in a certain position, or to prevent them from touching each other. They should, however, be spread out in a single layer.

The time of drying varies from two to four days, according to the weather. They should be turned daily. The proper degree of dryness is determined by manipulating the figs between the fingers in the morning while they are cold. If they are slightly tough and leathery to the touch, they are sufficiently dried. The great mistake in handling the Smyrna figs has been to overdry them, and this more than anything else has been the cause of the tough skins in some of the figs. The figs after they are dried are now dumped into a pile in the sweat room, where they remain for from eight to ten days, being turned every few days to permit them to go through a sweat and to thoroughly equalize the moisture in them. Before taking them to the packing-house, they are given a thorough washing in a cold brine, and all figs floating on the top, known as "floaters," are taken out. After being exposed to the sun for a half day, on 3 x 6-foot trays, to remove the superfluous moisture, they are dumped into sweat boxes, holding about two hundred pounds, when they are ready to be sent to the packing-house.

The same cleanliness in handling is observed there as elsewhere. The figs are first graded into four sizes—three, four, five, and six-crown. The three-crown are never packed, but are put up loose in fifty-pound boxes for confectionery purposes.

In order to facilitate packing, and to destroy any insect germs which may have gotten into the figs while they were being dried, they are placed on trays with wire screen bottoms in a steam chest for a few moments. When they come out, they are heated through and through, and are quite soft and pliable, so that the women who do the packing can manipulate them between their fingers without any difficulty. A small pan of water is placed near each woman, into which she occasionally dips her fingers to prevent the figs from sticking to them while they are being handled.

Each fig is split from the orifice to the stem end, a small knife being used for this purpose. The orifice is first turned to the underside of the fig. After splitting, the figs are spread out and flattened to the size of the forms into which they are packed, before being placed in the cartons. These forms are made to hold four bricks. The bottom layer is placed face downward, so that if either the bottom or the top of the brick be examined it will look the same. Before the facing layer is put in, the figs are pressed in the form. A block with followers fits into each form, and it is given a slight pressure in an ordinary letter-press. After a form is filled, it is taken to the wrapping table, where each brick is weighed and wrapped in waxed paper, and then placed in the cartons, which are sealed with small gold paper seals with the word "Calimyrna" embossed on them. These cartons are next placed in the wooden boxes and they are then ready for market.

A brief comparison of our method of handling, as compared with the methods employed in Asia Minor, will probably not be out of place.

There the figs are dried on rushes (*Scirpus holoschoenus*) which have been previously spread out on the ground, two inches deep and three feet wide. The only turning they receive is to shuffle them around with the hands. After being dried, they are taken to a tumble-down adobe shed and sorted into three grades. When enough of the figs are gathered together, they are packed into goat-hair sacks, holding in the neighborhood of two hundred and fifty pounds, and are transported to the nearest railroad station on camels. The Ottoman Railway Company provides special trains to carry the figs to Smyrna every day during the fig season. All the packing is done in Smyrna. On arrival in Smyrna, the invaluable camel is again brought into requisition, and the figs are either taken to the fig bazar to be disposed of, or to the packer, who has previously engaged them. The best packing-houses are substantial affairs, but the greater part, and there are fully fifty in Smyrna, are old warehouses, converted temporarily into fig-packing-houses. When the figs reach the packing-house they are dumped into large piles, around which are seated women and girls, who manipulate and sort them into three sizes. The packing is done by men, who sit on low stools before long wooden benches, on which are placed the loose figs, the boxes to be packed, and a small bucket of sea water to moisten the fingers so that the figs will not adhere to them. The laborers are none too clean; the figs themselves have more or less dirt adhering to them; the sea water used in manipulating is dipped from the quay, into which all the sewers of Smyrna empty. Not a very pleasant retrospect to the consumer of these figs. No attempt is made to clean the figs; they are never processed in any way from the time they are dried until they are packed in boxes for export. All Smyrna figs are wormy; in fact it is difficult, if a careful examination of the figs is made on their arrival here, to find a fig from which a worm has not issued. Fortunately for the stomachs of the consumers, these worms crawl out of the figs while they are being transported, and it is said to be no uncommon sight to see little white worms crawling all over the decks of a steamer loaded with a cargo of figs. The packers of Smyrna claim they have no time to manipulate the figs, and even if they had, no precautionary measures would be adopted, until they are forced by competition to pursue a different course, if they wish to successfully market their goods.

It is not to be denied that cheap labor and low freight rates from Smyrna will enter into active competition with the success of the undertaking of growing Smyrna figs on the Pacific Coast. It must not be forgotten, however, that our laborers work much more rapidly than those of the Orient, and this fact, in connection with the clean and careful manner of packing and placing the goods in attractive packages, is sure to win for our figs a reputation and a standing which we will always maintain.

Dried Adriatic figs are sold to-day at about one half the price of the imported figs, and even then there is a handsome profit for the grower and packer. If anything, it costs less to handle the Smyrna figs than the Adriatics, so it is not necessary to dwell at length on the fact that the Calimyrna, at the same price in competition with the imported article, will bring handsome returns to the growers.

There is no question but that Smyrna fig culture in California has a bright future. With everything in our favor—intelligence, perseverance, and progressiveness; a soil and climate unequaled in the world—the time is not far distant when California will not only be supplying the United States with all the figs it wants, but will be an exporter of this delicious, healthful product.

ORGANIZATION OF PRUNE-GROWERS.

The following resolution, by request, was read by President Cooper:

WHEREAS, This State Convention of California Fruit-Growers views with joy the progression to success, of the California Raisin-Growers' Association, the Southern California Fruit Exchange, and several other similar co-operative organizations of California fruit-growers, after passing though various unsatisfactory vicissitudes for several years; and

WHEREAS, We note with regret that the prune-growers of the State have been unable to carry through their co-operation on a successful and satisfactory basis; and

WHEREAS, We believe that had the Santa Clara prune-growers been together this year on the right co-operative plan, the results would have netted the producers from one to two million dollars more than they have received; therefore be it

Resolved, That this State Fruit-Growers' Convention earnestly recommends and urges the prune-growers of California to organize on a co-operative basis, adopting plans which shall be on the lines of the successful co-operative movements now in force among the raisin and orange producers of this State.

Resolution adopted.

NEXT MEETING PLACE.

MR. DORE. Has anything been done with reference to the next place of meeting?

PRESIDENT COOPER. It was mentioned this afternoon and a resolution passed, asking the State Board of Horticulture to hold two conventions instead of one; and there was a request made to-day to ask the Los Angeles people what they would do toward having a spring meeting there, and a further request that the sense of the people of that district relative to such meeting be taken, the State Board of Horticulture to be notified of what they will do in the matter of making it an interesting convention. There was some complaint that when the meeting was held there many of the members did not attend.

MR. DORE. That pertains only to the spring meeting?

PRESIDENT COOPER. Yes, sir.

MR. DORE. Then nothing was said toward the holding of the next annual meeting, or where it would be?

PRESIDENT COOPER. There was a resolution made at one of the previous meetings to have the Board select the place.

MR. DORE. I make a request for Fresno; but, under the present conditions, and not a large audience being present, it probably would not at this time be fair to make any attempt to have the matter of Fresno settled upon to-night.

PRESIDENT COOPER. I would state, on the part of the State Board of Horticulture, that we had a very well-attended meeting the last time in Fresno, and the Board will be very glad indeed to go there in the future, probably the next time, but it would be necessary for the people of Fresno to address the Board, making application for the meeting, and stating that the fruit-growers and others interested in the fruit industry there would form a committee of arrangements and would do a portion of the work necessary to make a successful convention. It does not make any difference to the State Board where the meetings are held. We desire to hold the conventions in those places that will be the most profitable, and where we will have the best meetings and the greatest interest taken. It is immaterial whether it is north, south, east, or west, so far as the State Board is concerned. What we want to do is to satisfy the fruit-growers and to accomplish all that is in our power by having these conventions.

VOTE OF THANKS.

COLONEL SHAW. I move that a vote of thanks be extended by this convention to the persons who have contributed such able papers, and to our President and other officers of the State Board of Horticulture for the admirable arrangements that were made and so successfully carried out for this San Francisco Convention.

Motion carried.

PRESIDENT COOPER. Gentlemen, you have my extreme thanks and I will say it would be in order to thank the reporters, who have labored so diligently with us.

MR. DORE. I move you that a vote of thanks be extended to the reporters and the newspapers of San Francisco, who so kindly and ably reported our proceedings at this convention.

Motion carried.

Upon motion, the convention adjourned *sine die.*

J. J. KEEGAN,
Secretary.

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